IBM System Storage

DCS9900 1269-3S2 Storage Expansion Unit Installation, Service, and User Guide

GA32-0613-00

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Preface

What is in this guide

This guide gives you step-by-step instructions on how to install, configure, and connect this product to your IBM DCS9900. In addition, it provides instructions on how to operate and service this product.

Who should use this guide

This guide assumes that you have a working knowledge of the SAS environment into which you are attaching the product. If you do not have these skills, or are not confident with the instructions in this guide, do not proceed with the installation.

NOTE : Not all information contained in the following sections will pertain directly to your particular product model.

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM System Storage DCS9900 product, and whom to call for service, if it is necessary.

Support information

For online support information for your IBM System Storage DCS9900 product, visit the following web site:

www.ibm.com/support

For telephone support information, in the United States, contact IBM at 1-800-IBM-SERV (426-7378).

In other countries, visit the following web site for support telephone numbers:

www.ibm.com/planetwide/

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables on your hardware to make sure that they are connected properly.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.

Using the documentation

Information about the DCS9900 product is available on a documentation CD that comes with your product. You can also access documents using the IBM Publications Center:

http://www.ibm.com/shop/publications/order

International Standards

This product complies with the applicable Information Technology (IT) standards set forth by EMC and product safety for world wide shipment.

Qualified Personnel

The personnel qualified to use this device are referred to within this document as follows:

- **Service Person:** Someone with the appropriate and necessary technical training and experience to be aware of hazards to which they may be exposed in performing a task and of measures to minimize the risks to that person or other persons.
- **User/Operator**: Any person authorized to handle/operate the product other than a *Service Person.*

Delivery and Subsequent Transportation of the Equipment

You must prepare your environment to accept the new product based on the installation planning information provided, with assistance from an IBM Installation Planning Representative (IPR) or IBM authorized service provider. In anticipation of the equipment delivery, prepare the final installation site in advance so that professional movers or riggers can transport the equipment to the final installation site within the computer room. If for some reason, this is not possible at the time of delivery, you must make arrangements to have professional movers or riggers return to finish the transportation at a later date. Only professional movers or riggers should transport the equipment. The IBM authorized service provider can only perform minimal frame repositioning within the computer room, as needed, to perform required service actions. You are also responsible for using professional movers or riggers when you relocate or dispose of equipment.

DANGER

Heavy equipment—personal injury or equipment damage might result if mishandled. (D006)

Figure P-1 Danger (D006) Heavy Equipment Label

Rack Relocation

Observe the following precautions when you need to relocate your rack:

- Before you add or remove drawers, always lower the leveling feet and install the anti-tip plates, or have the rack bolted to the floor.
- Always install drawers at the bottom of the rack first.
- Always remove drawers from the top of the rack first.
- Always install the heaviest drawers on the bottom of the rack.
- Never push on the sides of the rack.
- When relocating the DCS9900 rack with 1269-3S1 draws installed, the hard drives installed in the drawers must be removed to avoid a side-to-side tip-over hazard.

Safe Handling

Do not try to lift the enclosure by yourself. An enclosure can weigh from 9 kg (19.8 lb) to 37 kg (77.6 lb). Before removing an enclosure from a rack cabinet, always first remove all modules and drives from the enclosure to minimize weight.

Figure P-2 2 Man Lift Safety Label

Do not try to lift the enclosure by the handles on the PSU/Cooling module. The handles are not designed to support the weight of the populated enclosure.

Figure P-3 Weight Handling Label: Lifting and Tipping

Figure P-4 Pinch Hazard Label: Keep Hands Clear

Caution ! If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.

- The product can weigh up to 35 kg (77 lb). Do not try to lift it by yourself.

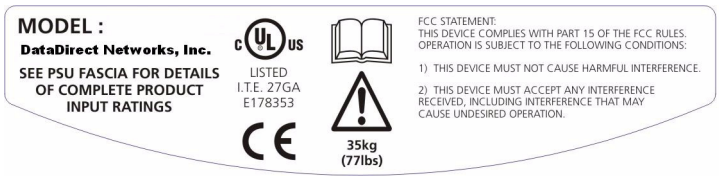
MODEL :
DataDirect Networks, Inc.
SEE PSU FASCIA FOR DETAILS OF COMPLETE PRODUCT INPUT RATINGS
LISTED
I.T.E. 27GA
E178353
35kg
(77lbs)
FCC STATEMENT:
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING CONDITIONS:
1) THIS DEVICE MUST NOT CAUSE HARMFUL INTERFERENCE.
2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

Figure P-5 Chassis Warning Label: Weight Hazard

Warning

The enclosure *MUST* be grounded before applying power.

Warning

Permanently unplug the product if you think that it has become damaged in any way and before you move it.

Caution ! Plug-in modules are part of the fire enclosure and must only be removed when a replacement can be immediately added. The system must not be run without all units in place. Operate the system with the enclosure top cover closed and blanking plates fitted where modules are missing.

- To comply with applicable safety, emission, and thermal requirements, keep all enclosure covers securely fitted and keep all bays fitted with plug-in modules.
- Enclosures must be only operated from a power supply input voltage range of 100 V AC to 240 V AC.When a redundant power input module is fitted, it must be operated from a reduced input voltage range of 200 V AC to 240 V AC.
- The plug on the power supply cord is used as the main disconnect device. Ensure that the socket outlets are located near the product and are easily accessible.
- The product is intended to operate with three (3) working PSUs. Before the removal or replacement of any module, disconnect all supply power for complete isolation.

Warning

To ensure protection against electric shock caused by HIGH LEAKAGE CURRENT (TOUCH CURRENT), the enclosure must be connected to at least two separate and independent sources. This should ensure a reliable earth connection.

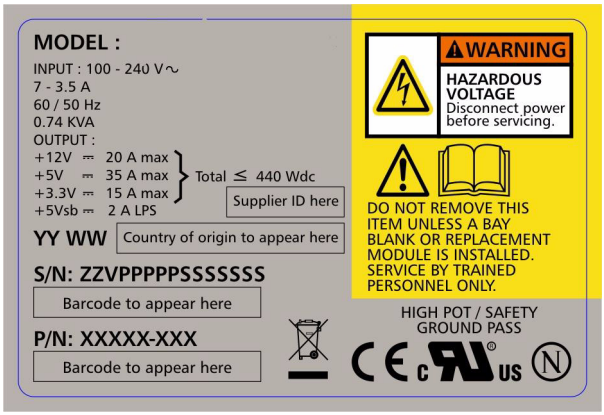
MODEL :
INPUT : 100 - 240 V~
7 - 3.5 A
60 / 50 Hz
0.74 KVA
OUTPUT :
+12V 20 A max
+5V 35 A max
+3.3V 15 A max
+5Vsb 2 A LPS
Total ≤ 440 Wdc
Supplier ID here
YY WW
Country of origin to appear here
S/N: ZZVPPPPPSSSSSSS
Barcode to appear here
P/N: XXXXX-XXX
Barcode to appear here
WARNING
HAZARDOUS VOLTAGE
Disconnect power before servicing.
DO NOT REMOVE THIS ITEM UNLESS A BAY BLANK OR REPLACEMENT MODULE IS INSTALLED. SERVICE BY TRAINED PERSONNEL ONLY.
HIGH POT / SAFETY GROUND PASS

Figure P-6 PSU/Cooling Module Caution Label: Do not operate with modules missing.

- A faulty power supply/cooling module must be replaced with a fully operational module within 24 hours.

Warning

To ensure your system has warning of a power failure, disconnect the power from the PSU by either the switch (where present) or by physically removing the power source, prior to removing the PSU from the enclosure.

- Do not remove a faulty power supply/cooling module unless you have a correct replacement product ready for insertion.

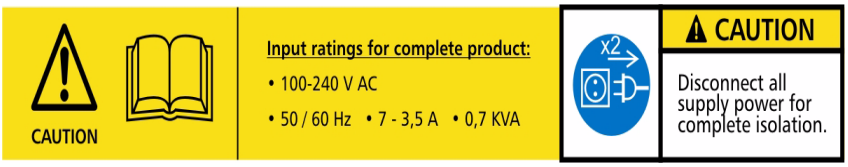
CAUTION
Input ratings for complete product:
• 100-240 V AC
• 50 / 60 Hz • 7 - 3,5 A • 0,7 KVA
x2
CAUTION
Disconnect all supply power for complete isolation.

Figure P-7 PSU Warning Label (Power Hazards)

- Always disconnect power to the product prior to removal of the power supply/cooling module from the product chassis.
- When powered by multiple AC sources, disconnect all supply power for complete isolation.
- Provide a safe electrical earth (ground) connection for the power cord. Check the grounding of the enclosure before applying power.
- Provide a suitable power source with electrical overload protection to meet the requirements detailed in the product's technical specifications.

Warning

Do not remove covers from the Power Supply Unit (PSU). Danger of electric shock inside. Return the damaged PSU to your supplier for repair.

Figure P-8 PSU Safety Label (Electric Shock Hazard Inside)

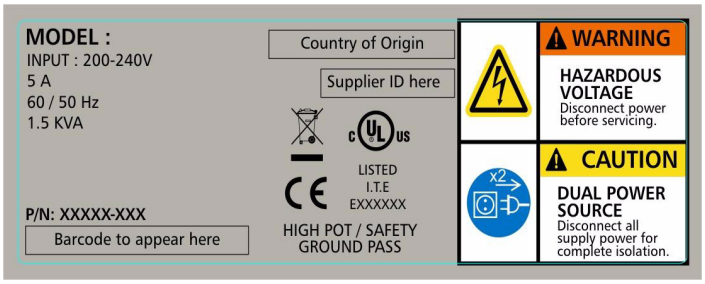

Figure P-9 Redundant Power Input Switch Module Label (Hazardous Voltage)

Warning

Operation of the product with *ANY* modules MISSING in the product's chassis will disrupt airflow and the drives will not receive sufficient cooling. It is *ESSENTIAL* that all bays in a product chassis are filled before operating the product.

Figure P-10 I/O Module Caution Label (Do not operate with modules missing)

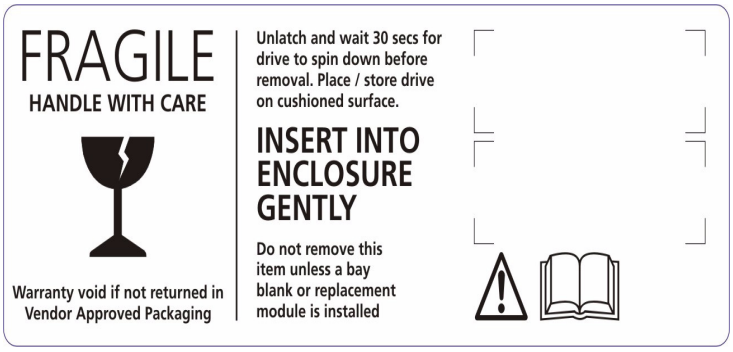
FRAGILE
HANDLE WITH CARE
Warranty void if not returned in Vendor Approved Packaging
Unlatch and wait 30 secs for drive to spin down before removal. Place / store drive on cushioned surface.
INSERT INTO ENCLOSURE GENTLY
Do not remove this item unless a bay blank or replacement module is installed

Figure P-11 Drive Carrier Module Caution Label (Drive Spin down time 30 seconds)

- Do not operate with modules missing.

Class 1 Laser Product

When the product is supplied with optical modules, it contains a laser that complies with Laser Class 1, US 21 QFR (J) & EN 60825-1, UL (NRTL) and TUV.

Caution ! If optical modules are to be provided and fitted by the end user, the modules must be a UL (or other North American NRTL) RECOGNISED COMPONENT, must be approved by TUV (or other European Product safety test house), and the laser in the module must comply with Laser Class 1, US 21 QFR (J) & EN 60825-1.

Important ! Observe all applicable safety precautions (for example, weight restrictions, handling batteries and lasers etc.) detailed in the preceding paragraphs when dismantling and disposing of this product or its components.

European Regulations

This equipment complies with European Regulations EN 55022 Class A: Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipments and EN50082-1: Generic Immunity.

Special Tools and Equipment

There are no special tools required, but in order to complete the assembly of some configurations, you may need the following (not supplied):

- Security keys (one of these should be included with your IBM System Storage DCS9900 3S2 Storage Expansion Unit for use with the drive locks).

Electronic Emission Notices

The following statements apply to this product. The statements for other products intended for use with this product will appear in their accompanying manuals.

Federal Communications Commission (FCC) Class A Statement

NOTE : This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital product complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for any interference caused by using other than recommended cables and connectors.

European Community contact:

IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Tele: 0049 (0)711 7851176
Fax: 0049 (0)711 785 1283
e-mail: tjahn@de.ibm.com

Australia and New Zealand Class A Statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Germany Electromagnetic Compatibility Directive

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der IBM gesteckt/eingebaut werden.

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"Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Generelle Informationen:

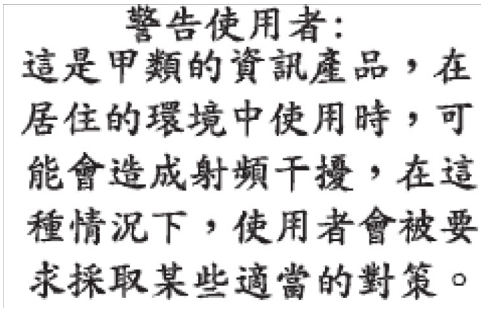
Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

People's Republic of China Class A Electronic Emission Statement

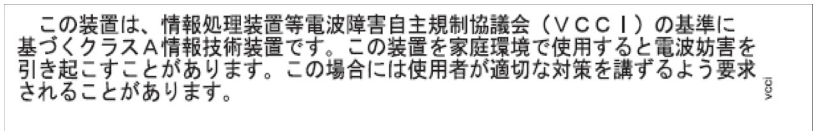
中华人民共和国“A类”警告声明

声 明
此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

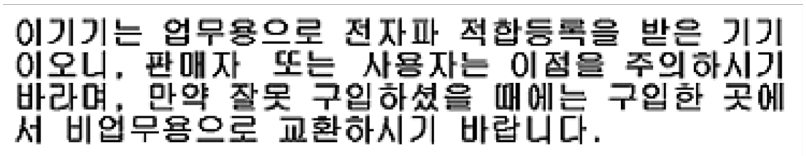
Taiwan Class A Warning Statement



Japan VCCI Class A ITE Electronic Emission Statement



Korean Class A Electronic Emission Statement



Taiwan Contact Information

Rack System Precautions

The following safety requirements must be considered when the product is mounted in a rack:

- The rack design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or in normal use.
- When loading a rack with the units, fill the rack from the bottom up and empty from the top down.
- System must be operated with low pressure rear exhaust installation. (Back pressure created by rack doors and obstacles should not exceed 5 pascals [0.5mm Water gauge].)
- The rack design should take into consideration the maximum operating ambient temperature for the unit, which is 32°C.
- The rack should have a safe electrical distribution system. It must provide overcurrent protection for the unit and must not be overloaded by the total number of units installed in the rack. Consideration of the electrical power consumption rating shown on the nameplate should be used when addressing these concerns.
- The electrical distribution system must provide a reliable earth grounding for each unit and the rack.
- Each power supply in each unit has an earth leakage current of 1.8mA. The design of the electrical distribution system must take into consideration the total earth leakage current from all the power supplies in all the units. The rack will require labelling with “HIGH LEAKAGE CURRENT. Earth connection essential before connecting supply”.
- The rack when configured with the units must meet the safety requirements of UL 60950 and IEC 60950.

Warning

Do not slide more than one product enclosure chassis out of the rack at a time, to avoid the rack from toppling over.

ESD Precautions

Caution ! It is recommended that you wear a working (examine before wearing) anti-static wrist or ankle strap and observe all conventional ESD precautions when handling Chassis slug-in modules and components. Avoid contact with backplane components, module connectors, etc.

Data Security

- Before beginning product installation, power down your DCS9900 and all attached peripheral devices.
- Disk drives are fragile. Handle them with care, and keep them away from strong magnetic fields.
- *All* the supplied plug-in modules and blanking plates must be in place for the air to flow correctly around the enclosure and to complete the internal circuitry.
- If the subsystem is used with modules or blanking plates missing for more than a few minutes, the enclosure can overheat, causing power failure and data loss.
- If you remove any drive module, you may lose data.
- If you remove a drive module, replace it immediately. Replace it with a drive module of the same type and capacity
- Do not abandon your backup routines. No system is completely foolproof.

How to Send Your Comments

Your feedback is important in helping us to provide the most accurate and high-quality information. If you have comments or suggestions for improving this publication, you can send us comments electronically by using the following address:

Internet: starpubs@us.ibm.com

You can also mail your comments by using the Readers' Comments Form in the back of this manual or direct your mail to:

International Business Machines Corporation
Information Development Dept. GZW
9000 South Rita Road
Tucson, AZ 85744–0001
U.S.A.

Chapter 1

Introduction

1.1 IBM System Storage DCS9900 3S2 Storage Expansion Unit

The IBM System Storage DCS9900 3S2 Storage Expansion Unit is based on an enclosure system incorporating 16 drive bays designed to support SAS disk drives.

The subsystem utilizes Low Profile,1 inch high, 3.5 inch form factor disk drives (Figure 1–1).

Figure 1–1 Storage Subsystem Enclosure

1.2 Enclosure Core Product

The IBM System Storage DCS9900 3S2 Storage Expansion Unit design concept is based on a subsystem together with a set of plug-in modules. The IBM System Storage DCS9900 3S2 Storage Expansion Unit as supplied comprise:

- Up to 16 **Drive Carrier Modules** (Figure 1–2)
- **Chassis** and **Backplane** with integral **Operators Panel**.(Figure 1–2)
- **Dummy Drive Carrier Modules** *(as required)*
- Two (2) plug-in **Power Supply/Cooling Modules**, (.AC, 450W (Figure 1–3)
- Two (2) plug-in **EBOD** (Expanded Bunch of Disks) **Serial Controller (EM) Modules**. (Figure 1–6).

1.2.1 Enclosure Chassis

The chassis consists of a sheet metal enclosure assembly containing a Backplane Printed Circuit Board (PCB) and module runner system. This chassis assembly also includes an integral Operators (Ops) Panel, mounted at the rear.

The chassis assembly contains 16 drive bays at the front, each of which accommodates a plug-in drive carrier module. The 16 drive bays are arranged in 4 rows of 4 drives. At the rear, the chassis assembly contains the integral Ops Panel module and four plug-in module bays to house two Power Supply/Cooling modules and two EBOD modules.

The Backplane PCB provides logic level signal and low voltage power distribution paths. Figure 1–2 shows typical front and rear views of an IBM System Storage DCS9900 3S2 Storage Expansion Unit chassis assembly.

The chassis is fitted with 19 inch rack mounting features which enables it to be fitted to standard 19 inch racks and uses 3 EIA units of rack space.

Note A drive bay is defined as the space required to house a single 1.0" high 3.5 inch disk drive in its carrier module. For example, a 1 x 4 bay module would take the space of 1 drive width by 4 drive bays high (in rack mount configuration). A 4 x 4 bay module is shown in Figure 1–2.

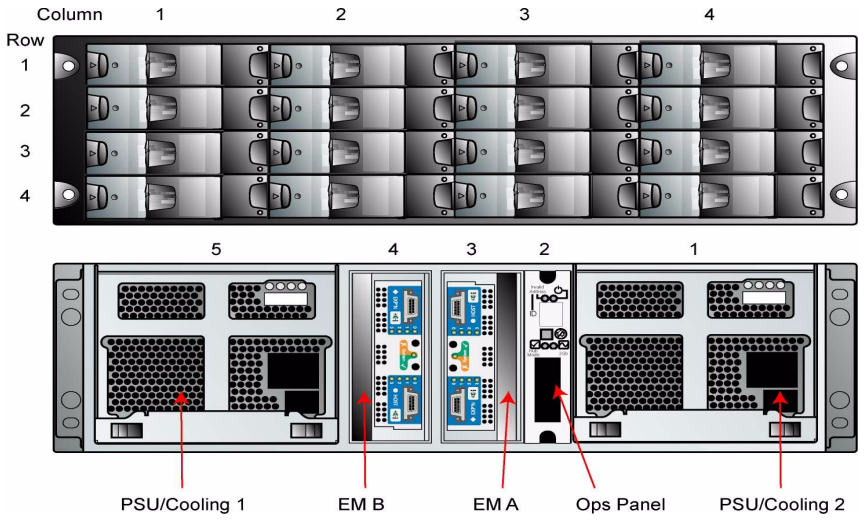


Figure 1–2 Enclosure Chassis (Front and Rear Views)

1.3 The Plug-in Modules

The IBM System Storage DCS9900 3S2 Storage Expansion Unit requires the following modules for normal operation:

- 2 x Power Supply/Cooling modules
- 2 x EBOD modules
- Up to 16 SAS drive carrier modules and/or dummy drive carrier modules, as required.

Note No drive bays should be left completely empty.

1.3.1 AC PSU/Cooling Module

Two (2) auto ranging AC 450W PSU/Cooling modules are supplied mounted in the rear of the enclosure as part of the subsystem core product.

The PSU voltage operating ranges are nominally 115V or 230V AC, selected automatically. Four LEDs mounted on the front panel of the Power Supply/Cooling module (Figure 1–3) indicate the status of the PSU and the fans.

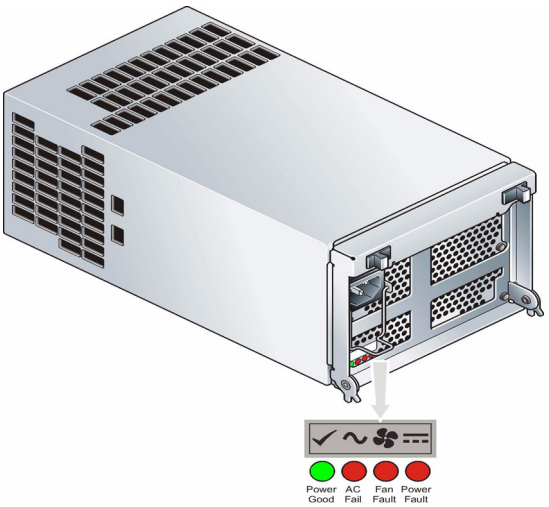


Figure 1–3 AC Power Supply/Cooling Module *(reverse orientation at installation)*

1.3.1.1 Multiple Power Supply/Cooling Modules

The IBM System Storage DCS9900 3S2 Storage Expansion Unit must always be operated with two Power Supply (PSU)/Cooling modules fitted. The two PSU/Cooling modules operate together so that if one fails the other maintains the power supply and cooling while you replace the faulty unit.

Module replacement should only take a few minutes to perform but must be completed within 10 minutes from removal of the failed module.

1.3.2 Operator's Panel

Supplied as an integral part of the enclosure core product, a typical Operator's (Ops) Panel is shown in Figure 1–4.

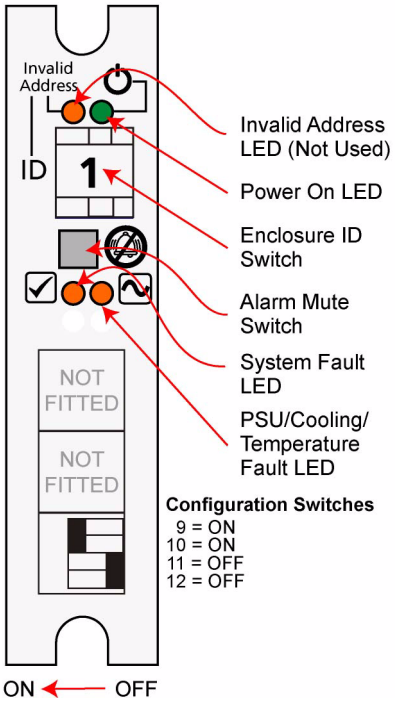


Figure 1–4 Ops Panel

The Ops Panel provides the enclosure with a micro-controller which is used to monitor and control all elements of the enclosure.

1.3.2.1 Ops Panel Indicators and Switches

The Ops Panel includes Light Emitting Diodes (LEDs) which show the status for all modules (shown in Table 3–1 on page 31), an Audible Alarm which indicates when a fault state is present, a push-button Alarm Mute Switch, and a thumb wheel Enclosure ID switch which is not used in this configuration.

1.3.3 EBOD Module

IBM System Storage DCS9900 3S2 Storage Expansion Units include an enclosure with rear facing bays which house two EBOD Serial Controller modules (Figure 1–5).

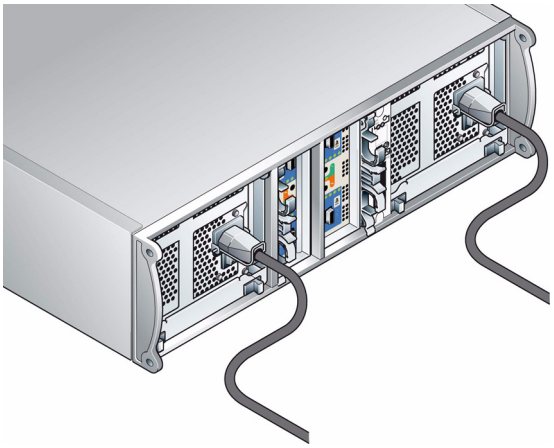


Figure 1–5 Rear View of Enclosure with AC PSUs and EBOD Modules Installed

The plug-in EBOD modules have been designed for integration into IBM System Storage DCS9900 3S2 Storage Expansion Units, utilizing SAS interconnections with the host computer system (Figure 1–6).

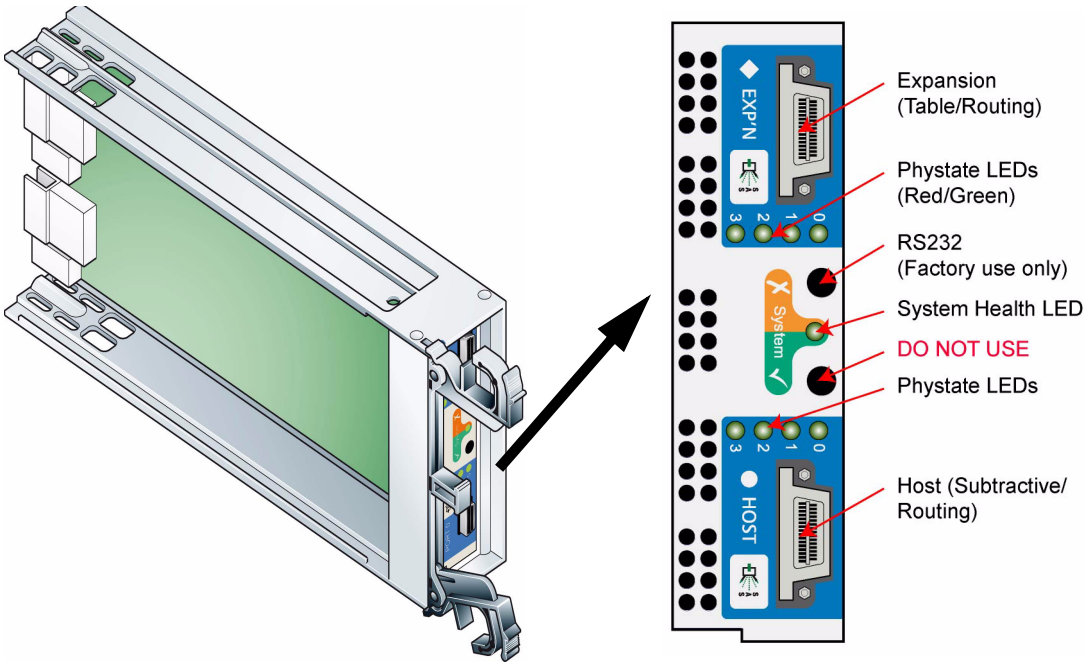


Figure 1–6 EBOD Module and Front Panel

Processors housed on the EBOD modules provide enclosure management and interface to devices on the Backplane, PSU, EM and Ops Panel, in order to monitor internal functions. These processors operate in a master slave configuration to allow failover. The enclosure must be configured with 2 modules.

The module incorporates the LED indicators as seen in Table 1–1.

Table 1–1 EBOD Module LEDs

LED Functions	State	Description
Phystate Green	ON Flashing OFF	Ready Active Not Ready
System Health	Red Green Flashing Red	Fault Good POST

1.3.4 Drive Carrier Module

The Drive Carrier Module comprises a hard disk mounted in a carrier (Figure 1–7). Each drive bay will house a single Low Profile 1.0 inch high, 3.5 inch form factor disk drive in its carrier.

Each disk drive is enclosed in a die-cast aluminum carrier which provides excellent thermal conduction, radio frequency and electro-magnetic induction protection, and affords the drive maximum physical protection.

The front cap also supports an ergonomic handle which provides the following functions:

- camming of carrier into and out of drive bays.
- positive 'spring loading' of the drive/backplane connector.
- an anti-tamper lock operated by a torx socket type key.

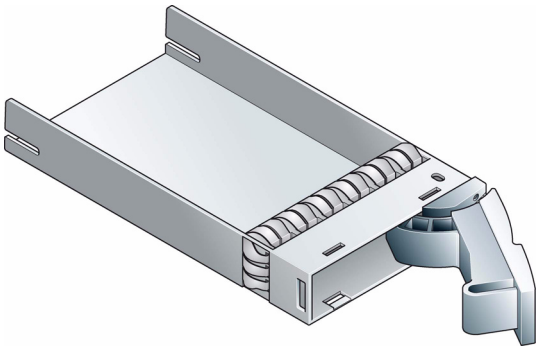


Figure 1–7 Drive Carrier Module

1.3.4.1 Drive Status Indicators

Each drive carrier incorporates two indicators: an upper (Green) and lower (Amber). In normal operation, the green indicator will be ON and will flicker as the drive operates.

Note Direct dock SDATA support for the green (activity) LED is variable. The amber indicator is OFF in normal operation and ON when there is a fault present.

1.3.4.2 Anti-tamper Locks

Anti-tamper locks are fitted in the drive carrier handles (Figure 1–8) and are accessed through the small cutout in the latch section of the handle.These are provided to disable the normal ‘pinch' latch action of the carrier handle and prevent accidental or unauthorized removal of drives.

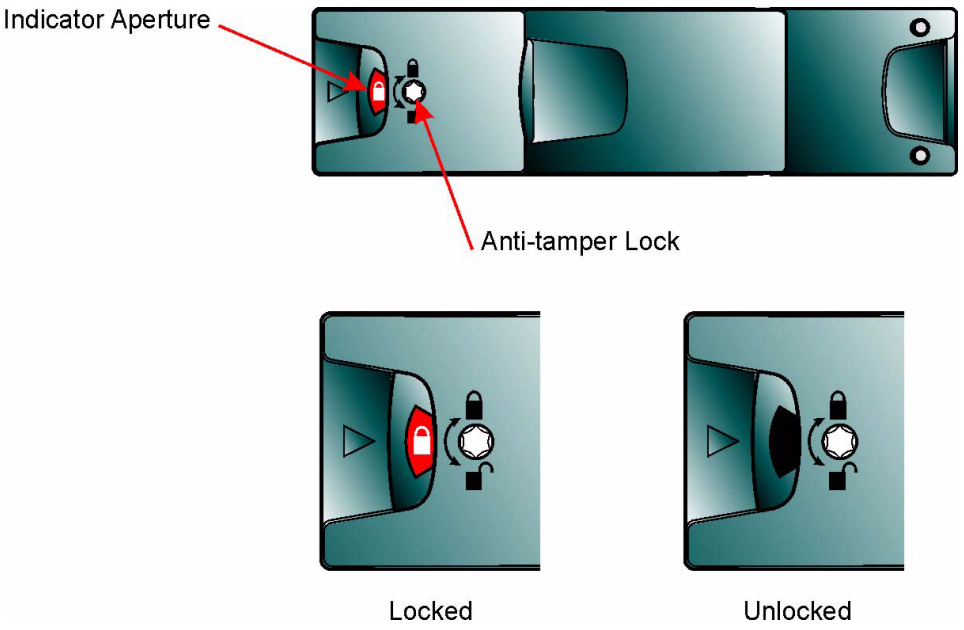


Figure 1–8 Anti-tamper Lock

1.3.5 Dummy Carrier Modules

Dummy carrier modules are provided for fitting in all unused drive bays. They are designed as integral drive module front caps with handles and must be fitted to all unused drive bays to maintain a balanced airflow.

1.4 Visible and Audible Alarms

The functional modules have associated status LEDs. The Ops Panel shows a consolidated status for all modules.

LEDs show constant green for good or positive indication. Constant Amber LEDs indicate there is a fault present within that module.

The Ops Panel also incorporates an Audible Alarm to indicate when a fault state is present and also an Alarm Mute push-button.

Warning **The Ops Panel is an integral part of the enclosure chassis assembly and is not field replaceable.**

1.5 IBM System Storage DCS9900 3S2 Storage Expansion Unit Technical Specification

1.5.1 Dimensions

SAS 16-bay drive enclosure Rack Enclosure	**inches**	**millimeters**
Height	5.1	130
Width across mounting flange	19.0	483
Width across body of enclosure	17.6	447
Depth from flange to rear of enclosure body	20.9	532
Depth from flange to maximum extremity of enclosure (rear hold down)	21.8	563
Depth from flange to furthest extremity at front of unit	0.6	15
Depth overall	22.4	568

1.5.2 Weight

Maximum Configuration Rack mount:	35kg (77lb)
Empty Enclosure (Rack)	9kg (19.8lb)
PSU/Cooling Module	4kg (8.8lb)
EBOD Module	0.9kg (1.98lb)

1.5.3 AC Power (450W PSU)

Voltage Range	100-120 / 200-240V AC Rated
Voltage Range Selection	Automatic
Frequency	50/60 Hz
Inrush Current	50A @ 260VAC
Power Factor	>0.98
Power	400 watts typical with 16 disk drives
Harmonics	Meets EN61000-3-2
Indicators	– Power Good – AC Input Fail – Fan Fault

Table 1–2 AC Power Input V, Current A, Power W

Input V	Current A	Power W
90	4.77	425
100	4.24	420

Table 1–2 AC Power Input V, Current A, Power W

Input V	Current A	Power W
120	3.48	414
132	3.15	411
180	2.37	416
200	2.14	414
240	1.82	412
254	1.74	411

1.5.3.1 AC Power Connector

Connector Type: IEC Plug

1.5.4 PSU Safety and EMC Compliance

Safety Compliance	UL, cUL and CE UL 60950-1 IEC 60950-1 EN 60950-1
EMC Compliance	CFR47 Part 15B Class A EN55022/CISPRA Class A EN55024

1.5.5 Power Cord

1 **United States**

Must be NRTL LISTED (National Recognized Test Laboratory, for example UL)

Cord type	SV or SVT, 18 AWG minimum, 3 conductor, 4.5 M max length.
Plug	NEMA 5-15P grounding-type attachment plug rated 120V 10A; *or* IEC 320 C14, 250V, 10A.
Socket	IEC 320, C-13, 250V, 10A.

2 **Europe and Others**

General requirements:

Cord type	Harmonized, H05-VVF-3G1.0
Socket	IEC 320, C-13, 250V, 10A.

Important **The Plug and the complete power cord assembly must meet the standards appropriate to the country, and must have safety approvals acceptable in that country.**

1.5.6 Environment

Table 1–3 Ambient Temperature and Humidity

	Temperature Range	Relative Humidity	Max. Wet Bulb
Operational	+5°C to +40°C (+41°F to +104°F)	20% to 80% non-condensing	23°C (73.4F)
Non-Operational	0°C to +50°C (+32°F to +122°F)	8% to 80% non-condensing	27°C (80.6°F)
Storage	+1°C to +60°C (+33.8°F to +140°F)	8% to 80% non-condensing	29°C (84.2°F)
Shipping	-40°C to +60°C (-40°F to +140°F)	5% to 100% non-precipitating	29°C (84.2°F)

Airflow	System must be operated with low pressure rear exhaust installation. (Back pressure created by rack doors and obstacles not to exceed 5 pascals [0.5mm Water gauge]).
Altitude, Operational	0 to 2133m (0 to 7,000ft) (10,000ft at maximum ambient of 35°C)
Operational Derating	Derate ambient temperature by 1 degree C for every 1000 feet (304.8 meters) increase above sea level.
Altitude, Non-Operational	-305 to 12,192m (-1000 to 40,000ft)
Shock, Operational	Vertical axis 5g peak 1/2 sine, 10ms
Shock, Non-Operational	30g 10ms 1/2 sine
Vibration, Operational	0.21grms 5-500 Hz Random
Vibration, Non-Operational	1.04grms 2-200 Hz Random
Vibration, Relocation	0.3g 2-200 Hz sine
Acoustics	**Sound Pressure Operating** - Less than 58 dB LpA average measured at the bystander positions. *(The 4 bystander positions are 1m horizontal and 1.5m off the floor positioned front, back, left, and right. The unit under test will be measured on the floor.)* Measured at 20°C
Orientation and Mounting	19" Rack mount (3 EIA Units)
• Rack Rails	To fit 800mm depth Racks compliant with IEC 297
• Rack Characteristics	Back pressure not exceeding 5 pascals (0.5mm water gauge)
Safety and Approvals	CE, UL, cUL
• EMC	EN55022 (CISPR - A), FCC A
Cooling	1365 BTU/hour
Capacity of exhaust	72 cfm

1.5.7 Interfaces

Drive support drive carrier specification

Attachment
- 1 x SAS 4 lane 3Gb wide port Host connector
- 1 x SAS 4 lane 3Gb wide port Expansion connector

1.5.8 EBOD Module Specification

Dimensions (internal) 103mm x 267mm (4 inches x 10.5 inches)
- component board area: 103mm x 240mm (4 inches x 9.5 inches)

Mounting rear, single bays 3 and/or 4 *(Figure 1–2)*

Connectors
- Host Port:
  - 1 x SFF8470 connector (4 lane)
- Expansion Port:
  - 1 x SFF8470 connector (4 lane)

1.5.8.1 LED Functions

Table 1–4 LED Functions

LED Functions	State	Description
Phystate Green	On Flashing Off	Ready Active Not Ready
System Health	Red Green Flashing Red	Fault Good POST

1.5.9 Drive Carrier Module Specification

Please contact your supplier for details of approved drives.

Important **Operating SAS 16-bay drive enclosure subsystems with non-approved drives may invalidate the warranty.**

Module Dimensions Height 29.1mm Width 106.55mm Depth 251 mm

Weight 0.98kg (1.0” 36Gb drive)

Operating Temperature 5° C to 40° C (when installed in an system enclosure with dual Power Supply/Cooling Modules)

Power Dissipation 19 Watts maximum

LEDs
- Drive Installed/Activity
- Drive Fault

1.5.10 Software Enclosure Services (SES) Support

The enclosure has a sophisticated self-monitoring and reporting function which conforms to ANSI SES specifications.This reports on such topics as:

- Enclosure temperature
- Fan speed
- Drive condition
- Operator panel status

Chapter 2
Getting Started

In this chapter, you are shown how to install your IBM System Storage DCS9900 3S2 Storage Expansion Unit and plug-in modules into an industry standard 19-inch rack cabinet.

Caution *When connecting up the IBM System Storage DCS9900 3S2 Storage Expansion Unit, use only the power cords supplied or cords which match the specification quoted in section 1.5.5.*

2.1 Planning Your Installation

Before you begin installation you should become familiar with the configuration requirements of your IBM System Storage DCS9900 3S2 Storage Expansion Unit, detailed in Table 2–1. The correct positions of each of the optional plug-in modules are shown in Figure 2–1. Please refer to sections 2.4 - 2.6 for details of EBOD module configurations and installation.

Table 2–1 IBM System Storage DCS9900 3S2 Storage Expansion Unit Configuration

Module	**Location**
Drive Bays	*ALL* drive bays must be fitted with either a drive carrier module or a dummy carrier; no bays should be left completely empty.
Power Supply/Cooling Modules (2)	Two Power Supply/Cooling modules must be fitted. Full power and cooling redundancy is provided while a faulty module is replaced. Install in rear Bays 1 and 5. **Note:** Rear bays are numbered from 1 to 5 commencing from the right.
Ops Panel	(integral part of chassis assembly) Install in rear Bay 2
EBOD Module (2)	Two are required. Install in rear Bays 3 and 4

Caution *Dummy Carriers MUST be fitted to ALL unused bays. There will be inadequate drive cooling if any are left open.*

2.1.1 Enclosure Drive Bay Numbering Convention

The enclosure drive bay numbering convention is shown in Figure 2–1. A drive bay is defined as the space required to house a single 1.0" high 3.5 inch disk drive in its carrier module.

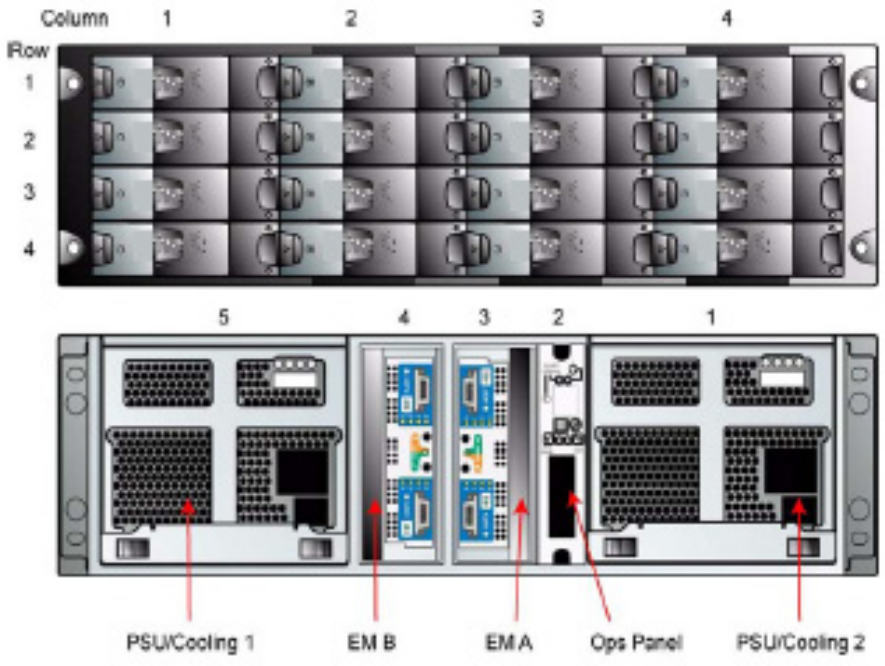


Figure 2–1 Module Locations

2.2 Enclosure Installation Procedures

Caution *The enclosures with all component parts installed are too heavy for a single person to easily install it in a Rack cabinet. The following procedures describe the installation of the IBM System Storage DCS9900 3S2 Storage Expansion Unit and highlight any critical co-requisite requirements and good handling practices which we encourage you to follow, so as to ensure that a successful installation is achieved in the easiest manner.*

Warning **Ensure that you have fitted, checked, and are wearing a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling IBM System Storage DCS9900 3S2 Storage Expansion Unit modules and components. Avoid contact with Backplane components and module connectors, etc.**

2.2.1 Pre-Requisites

Units are shipped with enclosures pre-installed in the racks.

IBM System Storage DCS9900 3S2 Storage Expansion Units are designed for installation into an industry standard 19-inch cabinet capable of holding the unit.

- Minimum depth 531 mm from front flange to rear metalwork (excludes rear cabling).

- Weight: up to 35kg dependent upon configuration per enclosure.
- A minimum gap of 25mm (1 inch) clearance between the rack cover and front of drawer; and 50mm (2 inches) rear clearance between rear-of-drawer and rear-of-rack is recommended in order to maintain the proper air flow around the enclosure.
- The rack should present a maximum back pressure of 5 pascals (0.5mm water gauge).

2.2.2 Chassis Installation

Units are shipped with enclosures pre-installed in the racks. Please refer to Appendix A for 1269-3S2 19" Rack Installation Instructions.

2.3 Power Supply/Cooling Module Installation

Install in the rear of the enclosure in positions 1 and 5.

Warning **Do not remove covers from the PSU/Cooling module. Danger of electric shock inside. Return the PSU to your supplier for repair.**

2.3.1 Parts Check List

2 x AC 450W PSU (Power Supply/Cooling Module)

2.3.2 AC PSU/Cooling Module Installation Procedure

Important **Both PSUs must be fitted "upside-down" as shown in Figure 2–1. If the cable strain relief wire tab is upside down it must be inverted by squeezing together the two sides of the tab, removing them from their mountings, inverting and then replacing them, as shown in Figure 2–2.**

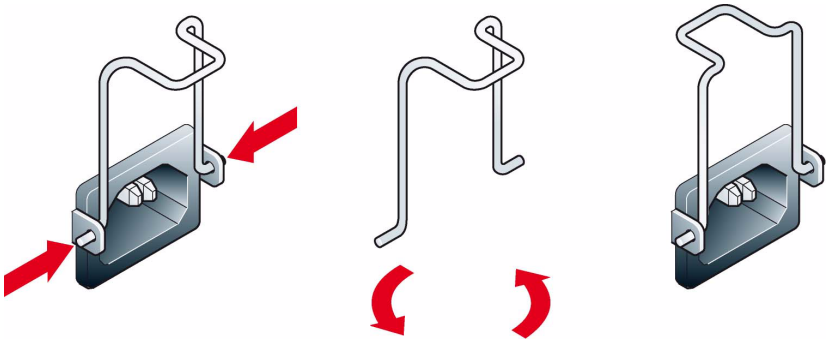


Figure 2–2 Inverting the Cable Strain Relief

1 Check for damage, especially to the rear connector on the supply.

Caution *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2 With the PSU handle in the open position (Figure 2–3), slide the module into the enclosure (Figure 2–4).

Important **install both PSU/Cooling modules in an “upside down* orientation.**

3 Cam the module home by manually closing the PSU handle (Figure 2–4). A click should be heard as the handle latches engage.

4 Connect the power supply cord to the power source and switch the power supply ON.

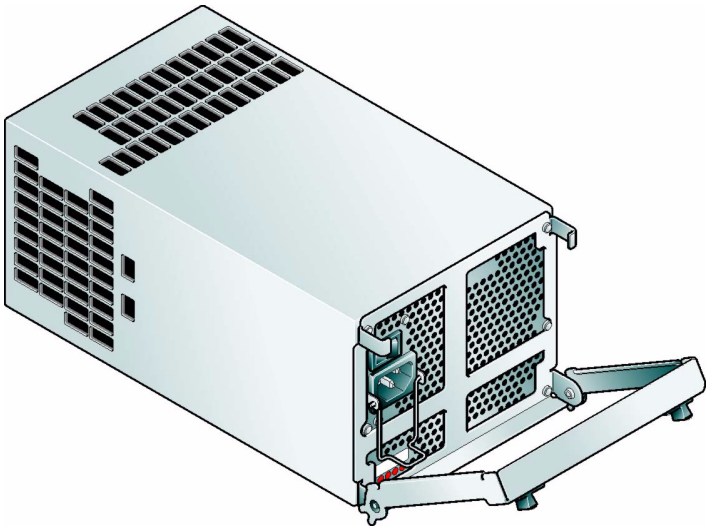


Figure 2–3 AC PSU/Cooling Module - Handle in Open Position *(reverse orientation at installation)*

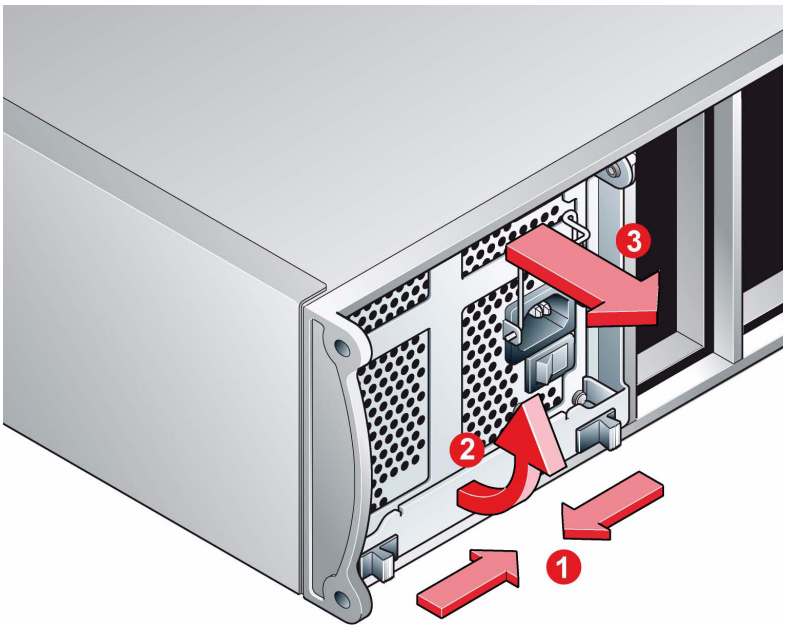


Figure 2–4 Installing a PSU Cooling Module

2.4 Connecting to the DCS9900

There is only one basic cabling configurations for the IBM System Storage DCS9900 3S2 Storage Expansion Unit: 1x16 (10 enclosures), which may be daisy chained to another set of 10.

2.4.1 Connecting Multiple Enclosures

The IBM System Storage DCS9900 3S2 Storage Expansion Unit is achieved by connecting additional EBOD (Expanded Bunch of Disks) enclosures to the Expansion ports of the EBOD Modules. Multiple enclosures are connected together by using SAS compliant cables. This configuration is known as daisy chaining and is illustrated in Figure 2–7.

Important **The SAS connectors must be secured with their screw lock assemblies. The screw locks ensure a robust mechanical connection and are essential in order to avoid cable stresses reaching the solder joints of the connector.**

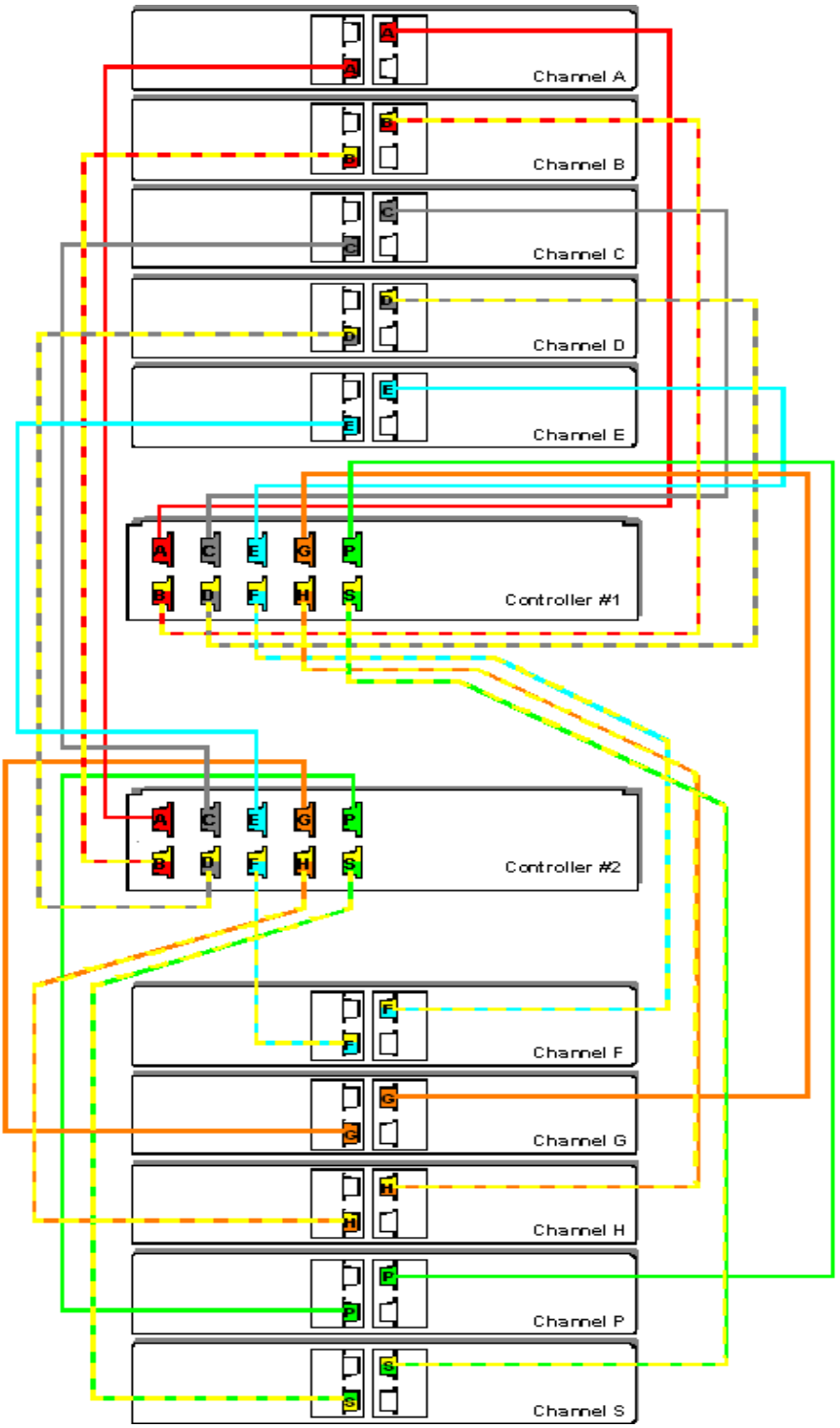


Figure 2–5 DCS9900 to 10 Enclosures (1 x 16 Configuration)

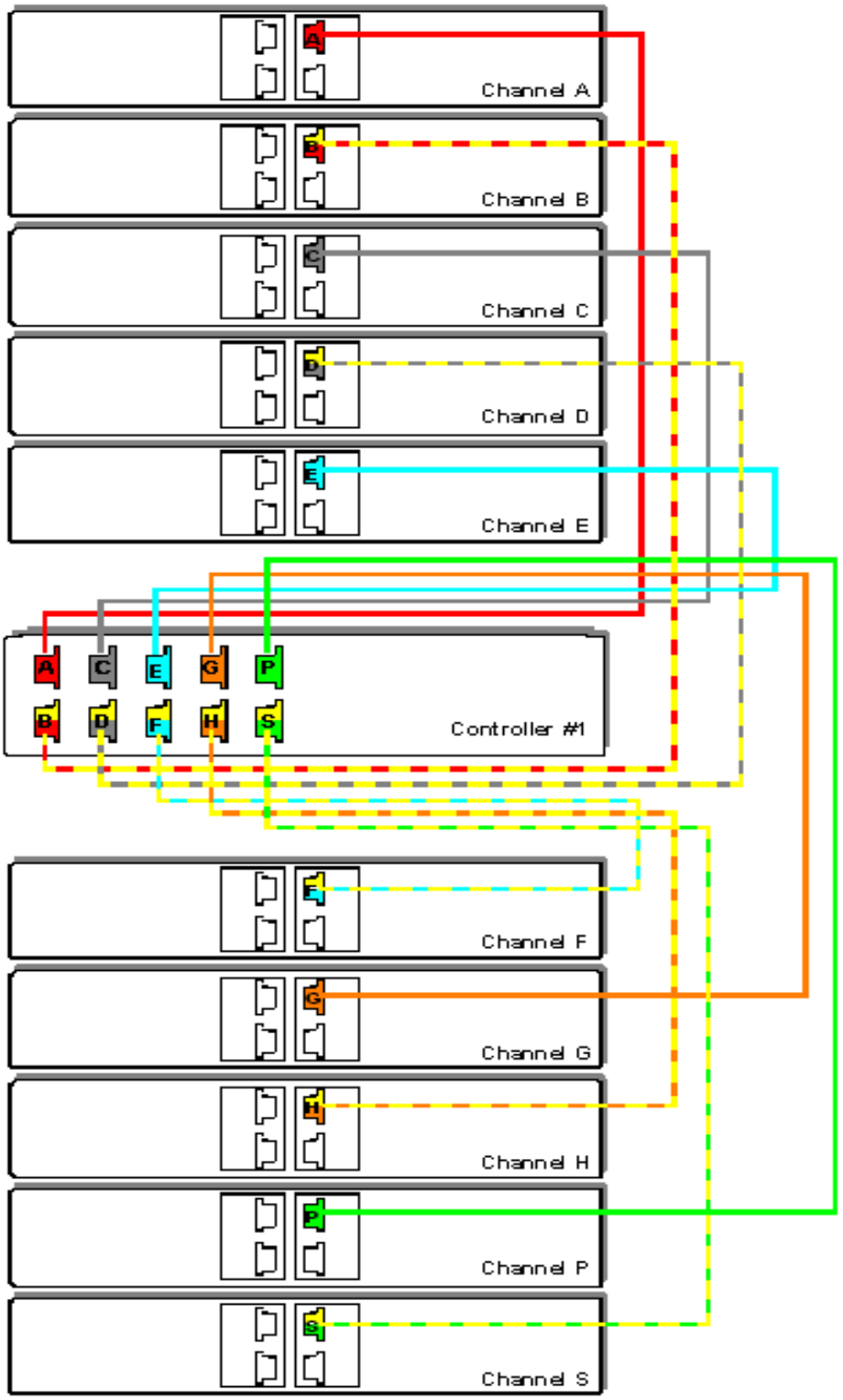


Figure 2–6 DCS9900 to 10 Enclosures (1 x 16 Configuration) Singlet View

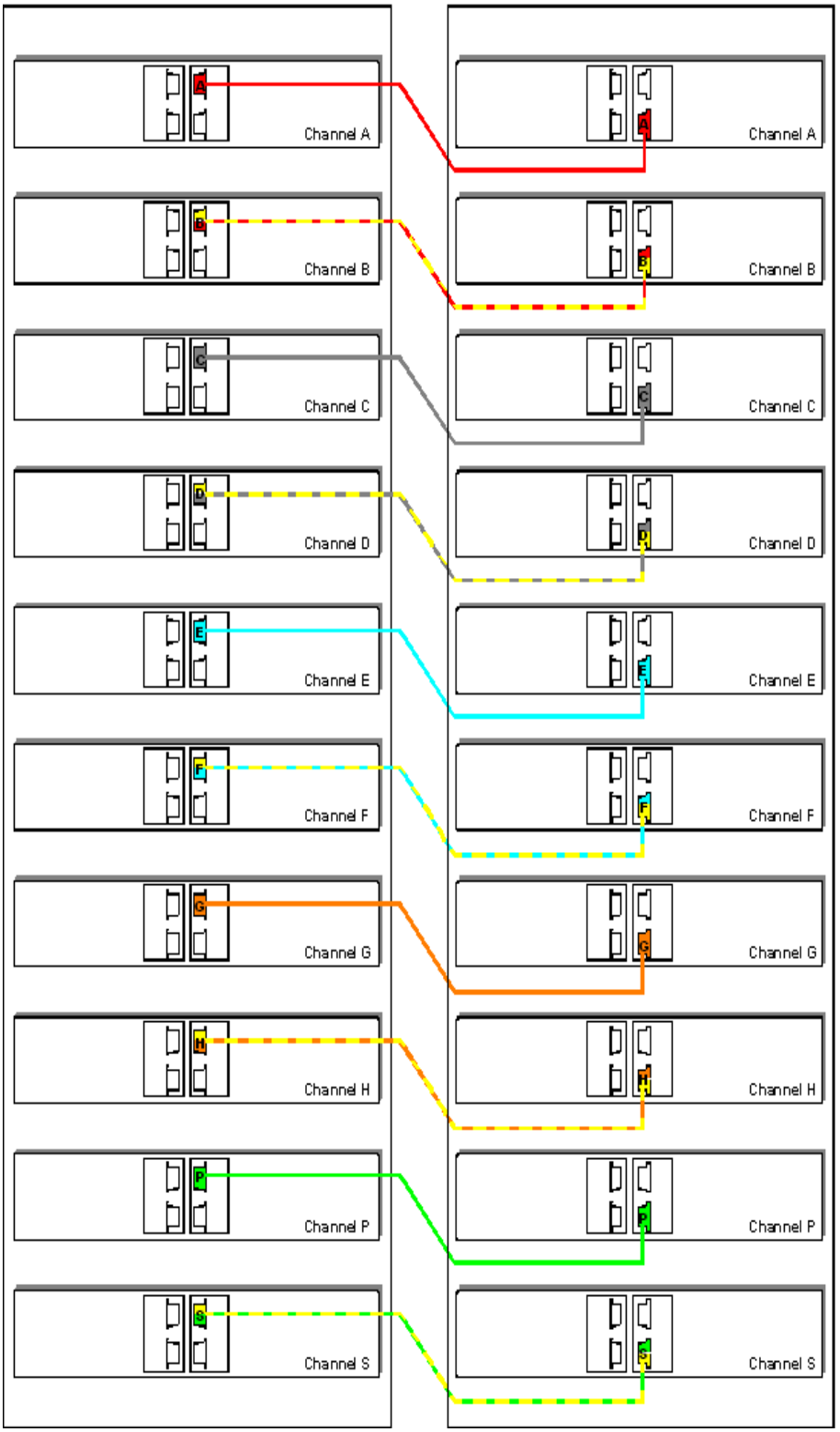


Figure 2–7 Daisy Chain (1 x 16 Configuration)

2.5 Partially Populated Enclosure

If the enclosure is not fully populated, it is recommended to load the drive columns and not rows for maximum performance, (Figure 2–8).

Figure 2–8 Partially Populated Enclosure

2.6 EBOD Module Installation

Warning **Operation of the Enclosure with *ANY* modules missing will disrupt the airflow and the drives will not receive sufficient cooling. It is *ESSENTIAL* that all apertures are filled before operating the unit. Dummy Carriers are available for this purpose.**

2.6.1 Parts Check List

2 EBOD Modules

2.6.2 Installation Procedure

Check for damage especially to the interface connector, do not install if any pins are bent.

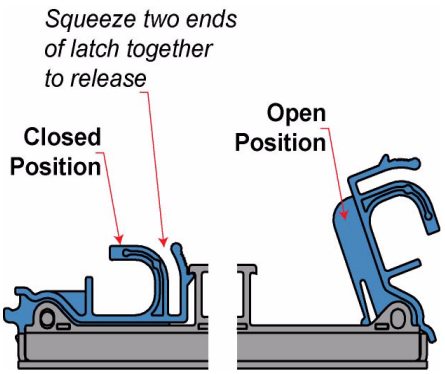


Figure 2–9 Module Latch Operation

1. The modules should be installed in rear bays 3 and 4 of the Enclosure (Figure 2–1).
2. With the latch in the open position (Figure 2–9), slide the EBOD module into the enclosure until the latch engages automatically.

3 Cam the module home by manually closing the latches (Figure 2–10).

4 A click should be heard as the latch engages.

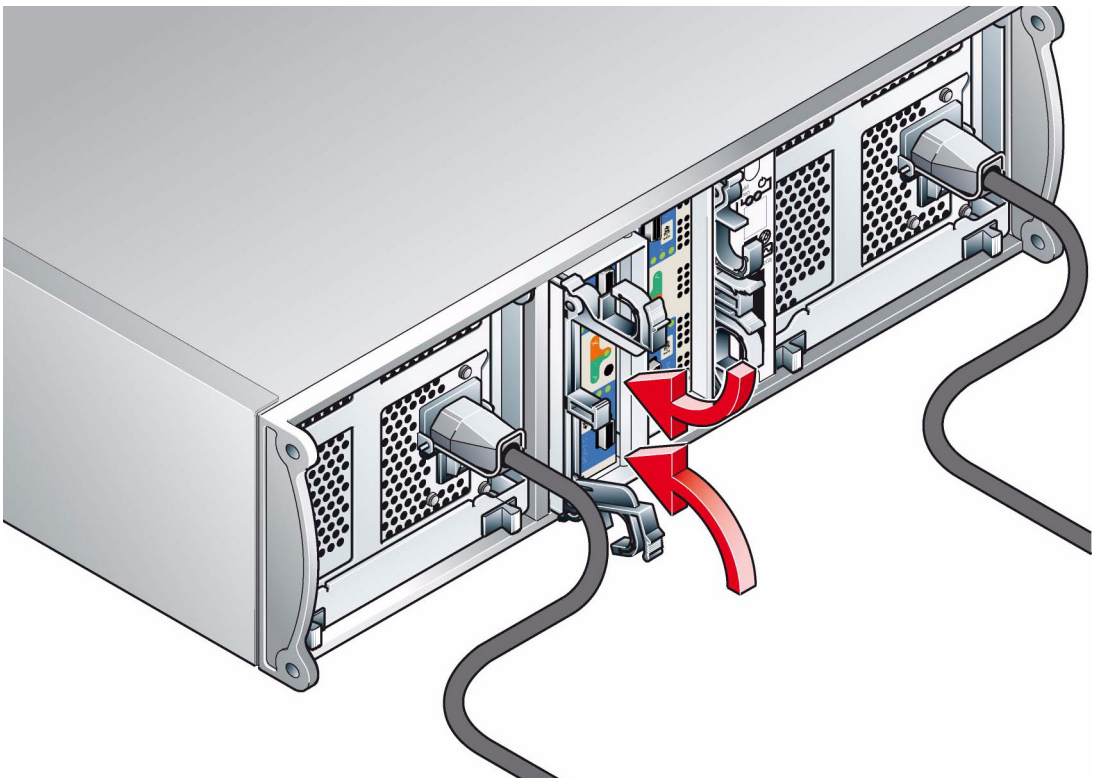


Figure 2–10 Installing an EBOD Module

2.7 Drive Carrier Configuration

2.7.1 Planning and Configuring Your Installation

2.7.1.1 System Configuration

Important **Before you begin installation you should become familiar with the configuration requirements of your IBM System Storage DCS9900 3S2 Storage Expansion Unit. Please refer to Section 2.1 for information on your overall system configurations.**

When planning your system configuration, please remember that all *IBM System Storage DCS9900 3S2 Storage Expansion Unit* drive bays must be filled with either a drive carrier or front dummy carrier module, no bays should be left completely empty.

Warning **Operation of the Enclosure with *ANY* modules missing will disrupt the airflow and the drives will not receive sufficient cooling. It is *ESSENTIAL* that all apertures are filled before operating the unit. Dummy Carriers are available for this purpose.**

2.7.1.2 Drive Configuration 1x16

Important **After you have installed the drive carrier modules in your IBM System Storage DCS9900 3S2 Storage Expansion Unit, please refer to Section 2.6 for configuration information relevant to the EBOD module you are installing.**

Table 2–2 1x16 Drive Slot Arrangement: Enclosure Front View

Drive A1	Drive A5	Drive A9	Drive A13	Channel A
Drive A2	Drive A6	Drive A10	Drive A14	
Drive A3	Drive A7	Drive A11	Drive A15	
Drive A4	Drive A8	Drive A12	Drive A16	
Drive B1	Drive B5	Drive B9	Drive B13	Channel B
Drive B2	Drive B6	Drive B10	Drive B14	
Drive B3	Drive B7	Drive B11	Drive B15	
Drive B4	Drive B8	Drive B12	Drive B16	
Drive C1	Drive C5	Drive C9	Drive C13	Channel C
Drive C2	Drive C6	Drive C10	Drive C14	
Drive C3	Drive C7	Drive C11	Drive C15	
Drive C4	Drive C8	Drive C12	Drive C16	
Drive D1	Drive D5	Drive D9	Drive D13	Channel D
Drive D2	Drive D6	Drive D10	Drive D14	
Drive D3	Drive D7	Drive D11	Drive D15	
Drive D4	Drive D8	Drive D12	Drive D16	
Drive E1	Drive E5	Drive E9	Drive E13	Channel E
Drive E2	Drive E6	Drive E10	Drive E14	
Drive E3	Drive E7	Drive E11	Drive E15	
Drive E4	Drive E8	Drive E12	Drive E16	

Table 2–2 1x16 Drive Slot Arrangement: Enclosure Front View

Drive F1	Drive F5	Drive F9	Drive F13	Channel F
Drive F2	Drive F6	Drive F10	Drive F14	
Drive F3	Drive F7	Drive F11	Drive F15	
Drive F4	Drive F8	Drive F12	Drive F16	
Drive G1	Drive G5	Drive G9	Drive G13	Channel G
Drive G2	Drive G6	Drive G10	Drive G14	
Drive G3	Drive G7	Drive G11	Drive G15	
Drive G4	Drive G8	Drive G12	Drive G16	
Drive H1	Drive H5	Drive H9	Drive H13	Channel H
Drive H2	Drive H6	Drive H10	Drive H14	
Drive H3	Drive H7	Drive H11	Drive H15	
Drive H4	Drive H8	Drive H12	Drive H16	
Drive P1	Drive P5	Drive P9	Drive P13	Channel P
Drive P2	Drive P6	Drive P10	Drive P14	
Drive P3	Drive P7	Drive P11	Drive P15	
Drive P4	Drive P8	Drive P12	Drive P16	
Drive S1	Drive S5	Drive S9	Drive S13	Channel S
Drive S2	Drive S6	Drive S10	Drive S14	
Drive S3	Drive S7	Drive S11	Drive S15	
Drive S4	Drive S8	Drive S12	Drive S16	

2.7.2 Parts Check List

- Drive Carrier module, or
- Dummy Carrier module

2.7.3 Installation Procedure

1 Ensure that the anti-tamper locks are disengaged.

2 Release the carrier handle by pressing the latch in the handle towards the right and insert the carrier into the enclosure (Figure 2–11).

Important **For a Rack Mounted System: Ensure that the carrier is orientated so that the drive is uppermost and the handle opens from the left.**

3 Slide the carrier, gently, all the way into the enclosure until it is stopped by the camming lever on the right of the carrier (Figure 2–12)

4 Cam the carrier home - the camming foot on the base of the carrier will engage into a slot in the enclosure. Continue to push firmly until the handle fully engages. A click should be heard as the latch engages and holds the handle closed (Figure 2–13).

Note Ensure that the handle always opens from the left.

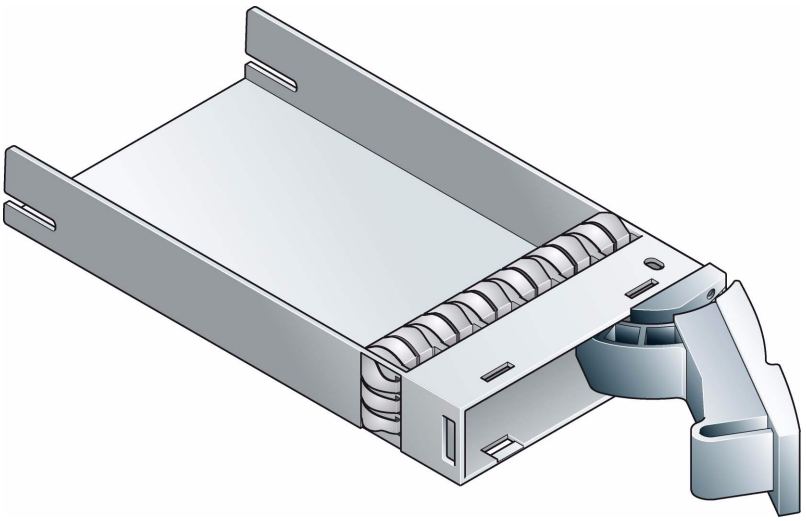


Figure 2–11 Installing a Drive Carrier Module (1)

Note Removal is the reverse of this procedure (press on the latch to release the handle).

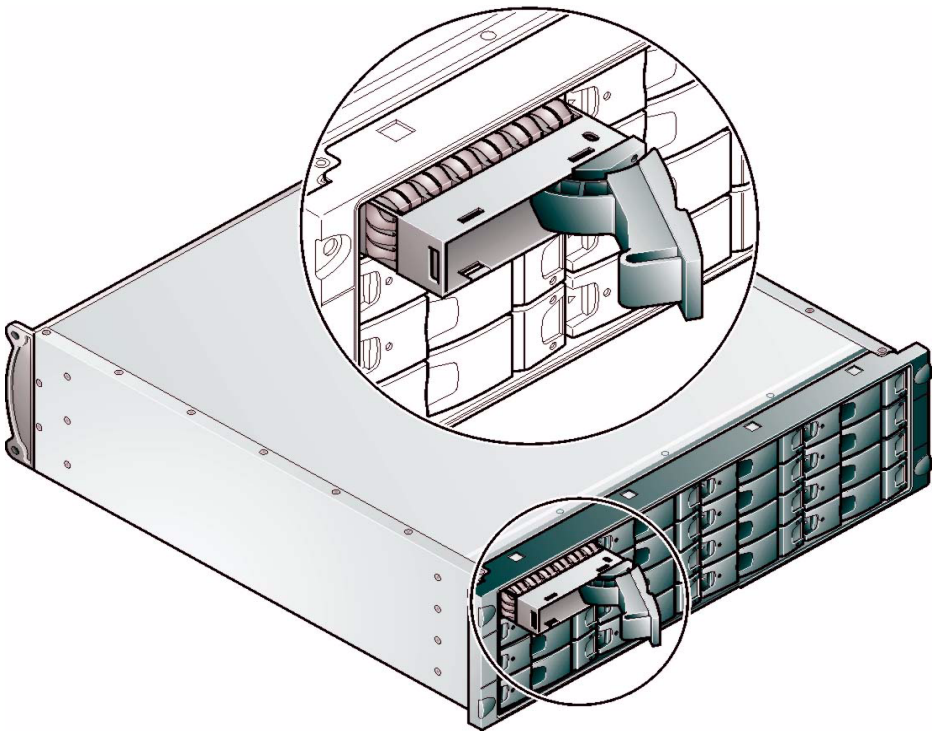


Figure 2–12 Installing a Drive Carrier Module (2)

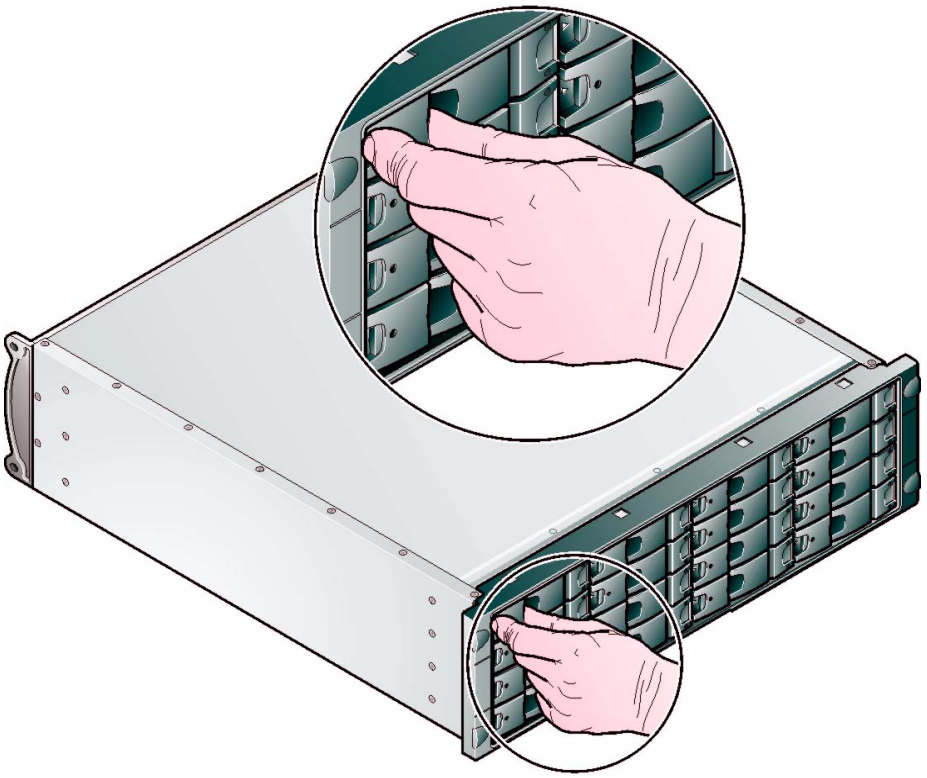


Figure 2–13 Installing an Drive Carrier Module (3)

2.7.4 Dummy Carrier Modules

Any unused drive bays must be fitted with a dummy carrier module.

2.7.5 Engaging the Anti-tamper Locks

The anti-tamper locks are fitted in the drive carrier handles and are accessed through the small cutout in the latch section of the handle.

Drives are supplied with the locks set in the locked position.

2.7.5.1 Activating the Locks

1 Carefully insert the lock key provided into the cutout in the handle.

2 Insert the key into its socket.

3 Rotate the key in a clockwise direction until the indicator is visible in the aperture beside the key.

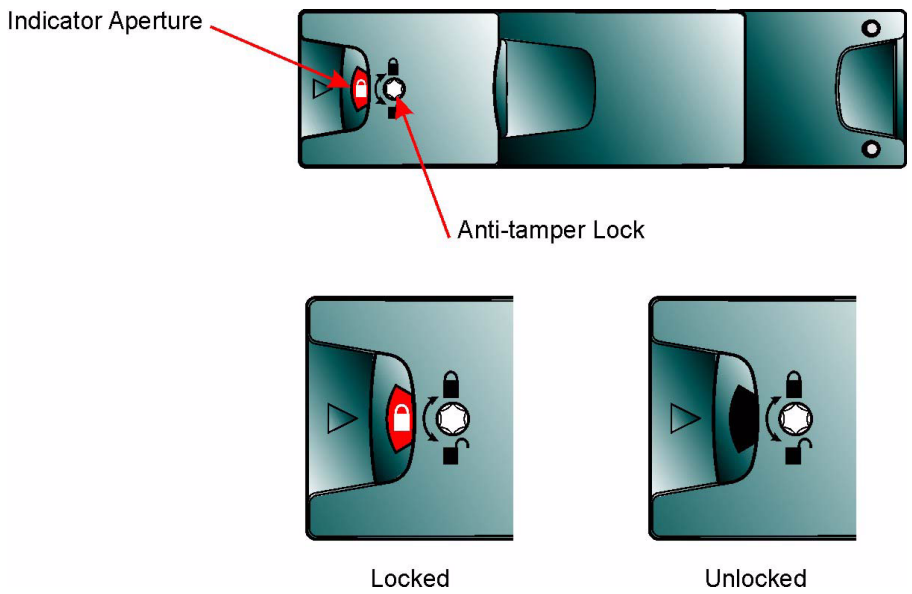


Figure 2–14 Activating the Anti-tamper Lock

4 Remove the key.

De-activation is the reverse of this procedure, that is: Rotate the key in an anti-clockwise direction until the indicator is no longer visible in the aperture beside the key.

Note A drive carrier cannot be installed if its anti-tamper lock is activated outside the Enclosure.

2.8 Power Cord Connection

2.8.1 Parts Check List

- Power cord to requisite local standards

2.8.2 Procedure

1. Attach the power cord to the Power Supply/Cooling Modules.
2. Attach the power cord to the in-line IEC connector in this cord.
3. Switch on each Power Supply/Cooling Module.
4. The “PSU Good” and “AC Fail” LEDs on the PSUs indicate whether AC power is present.

Caution *The power connections must always be disconnected prior to removal of the Power Supply/Cooling module from the enclosure.*

2.9 Grounding Checks

Important **The following information is applicable to AC power sources only.**

The product must only be connected to a power source that has a safety electrical earth connection.

Warning **If more than one product is fitted in a rack, the earth connection to the rack is even more important, because the rack will then have a high “EARTH LEAKAGE CURRENT” (“TOUCH CURRENT”).**

The earth connection to the rack must be checked before switching the power on, by an electrical engineer who is qualified to perform the check according to the appropriate local and national standards.

Chapter 3

Operation

3.1 Before You Begin

Before powering up the enclosure, please ensure that all the modules are firmly seated in their correct bays.

3.2 Power On

Caution *Do not operate the subsystem until the ambient temperature is within the specified operating range. If the drives have been recently installed, ensure they have had time to acclimatize before operating them.*

Note Please refer to Section 3.2.3 for details of the Ops Panel LEDs and related fault conditions.

Follow the procedure below to Power On the enclosure.

1 Apply AC power to the enclosure. Turn the Power Supply modules to ON.

2 On the Ops Panel, the Audible Alarm beeps once, all LEDs flash for 7 seconds, then the Alarm double beeps.

3 All LEDs on the Ops Panel should be lit (Green) when the enclosure power is activated (and the disk drive motors should start).

Note All LEDs on the Ops Panel should be lit Green at power up to indicate that the system is functioning correctly. If any show Amber, a problem exists. Follow the procedures in sections 4.4.2, 4.4.4 and 4.4.5 on page 38, page 39 and page 40.

Important **If AC power is lost for any reason, on restoration of power the enclosure will re-start automatically.**

3.2.1 PSU/Cooling Module LEDs

The PSU/Cooling module incorporates 4 LEDs, located below the On/Off switch (Figure 3–1).

- Under Normal conditions, the LEDs should all be illuminated constant GREEN.
- If a problem is detected, the color of the relevant LED will change to AMBER. Please refer to Table 4–1 for further information.

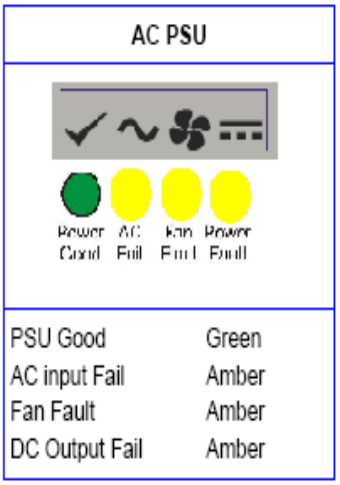


Figure 3–1 PSU LEDs

3.2.2 Ops Panel Switches

The Ops Panel Enclosure ID switch is reported via SES page to assist in enclosure identification.

Note A Host can override the value set in the ID switch.

Configuration switches (Figure 3–2) must be set to the following positions:

Switch	9	10	11	12
Position	ON	ON	OFF	OFF

3.2.3 Ops Panel LEDs

The Ops Panel LEDs fault and status conditions are shown in Figure 3–2 and defined in Table 3–1.

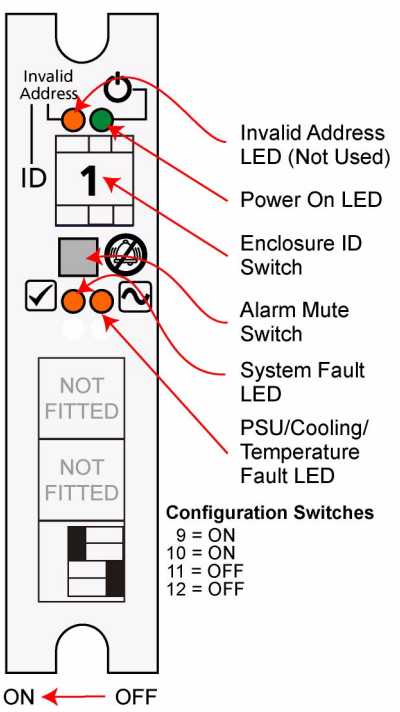


Figure 3–2 Ops Panel LEDs and Switches

Table 3–1 Ops Panel LEDs

Ops Panel LEDs				
Power (Green	PSU/Cooling/ Temp (Amber)	System (Amber)	Other Associated LEDs or Alarms	State Description
On	Off	Off		Power On, enclosure ready.
On	On	On	Single beep, then double beep	Ops panel power on (5s) test state.
On	On	Off	PSU LEDs or Fan LEDs intermittent audible alarm	Any PSU fault or Fan fault.
On	On	Flash	intermittent audible alarm	Over or under temperature.
On	Off	On	LED on EM	Processor on EBOD Module A failed.
On	Off	On	LED on EM	Processor on EBOD Module B failed.
On	Off	On	None	Unknown (invalid or mixed) module type installed, or 12C bus failed.
On	Flash	Flash	PSU removed	PSU removed and system power redundancy check option set. No indication if option not set.
On	Flash	On	intermittent audible alarm	Ops to EBOD Module communications failed.

Please refer to section 4.4 on page 37 for details of fault indications.

Note Although the Invalid Address error LED (shown in Figure 3–2) is generally not used, it will flash if you change the thumbwheel setting while the unit is powered. The only purpose of the thumbwheel is to identify the chassis, but it is only read at start of day. If it is change during operation, an error condition is created.

3.3 Disk Drive LEDs

Each drive carrier incorporates two indicators, an upper (GREEN) and lower (AMBER).

- In normal operation the Green LED will be ON and will flicker as the drive operates.
- The Amber LED will be OFF In normal operation. It will only be ON if there is a drive fault. Additionally, the amber LED can be made to flash by the DCS9900 as a means of identifying a particular drive.

3.4 Power Down

To power the Enclosure down, either:

- Switch off the Power Supply/Cooling modules installed in the Enclosure.
  or
- Remove AC at the power source.

Chapter 4

Troubleshooting and Problem Solving

4.1 Overview

The IBM System Storage DCS9900 3S2 Storage Expansion Unit includes a processor and associated monitoring and control logic to enable it to diagnose problems within the enclosure's power, cooling, and drive systems.

The Enclosure Services Processor is housed along with the Ops Panel in the rear of the enclosure.

The sensors for power and cooling conditions are housed within the Power Supply/Cooling modules. There is independent monitoring for each unit.

If a fault is indicated on the Ops Panel, please refer to Table 4–2.

4.1.1 Initial Start-up Problems

4.1.1.1 Faulty Cords

First check that you have wired up the subsystem correctly. Then, if:

- cords are missing or damaged
- plugs are incorrect
- cords are too short

Call your supplier for a replacement.

4.1.1.2 Alarm Sounds On Power Up

Please refer to Section 4.2.

4.1.1.3 Physical Link LEDs on EBOD Module Not Lit

Check cable connectivity.

4.1.1.4 Controller Doesn't Recognize the IBM System Storage DCS9900 3S2 Storage Expansion Unit

1. Check that the SAS interface cables from the IBM System Storage DCS9900 3S2 Storage Expansion Unit to the host computer are fitted correctly.
2. Check that any SAS interface cables to the 16 Bay expansion enclosures are fitted correctly.
3. Check that the LEDs on all installed drive carrier modules are illuminated Green. Note that the drive LEDs may not be lit during drive spinup.
4. Check that all drive carrier modules have been correctly installed.
5. Check that the EBOD module setup is as follows:
   - Check that the EBOD module has been correctly installed and all external links and cables are securely fitted.
   - Check the maximum cable length has not been exceeded.
6. Check that the configuration switches on the Ops Panel are set correctly:
   - Switches 9 and 10 should be ON.
   - Switches 11 and 12 should be OFF.

4.2 Audible Alarm

The Ops Panel also includes an Audible Alarm which indicates when a fault state is present. The following conditions will activate the Audible Alarm:

- Drive Fault
- Fan Fault
- Voltage out of range
- Over temperature
- Thermal overrun
- System fault

4.2.1 Audible Alarm Mute

When the Audible Alarm sounds, it may be muted by pressing the Alarm Mute push-button. Automatic muting will take place after two minutes if the mute switch is not manually operated. The Alarm Mute push-button is located above the indicators on the Ops Panel (Figure 4–2).

When the alarm is muted it will continue to sound with short intermittent bleeps to indicate that a problem still exists. It will be silenced when all problems are cleared. (Refer to Thermal Shutdown states, Section 4.4.5).

LED Test Mode

The Alarm Mute push-button can also be used to test the LEDs on the Ops Panel. When the Mute push-button is held, all LEDs will be illuminated if there are no faults present.

4.3 LEDs

Green LEDs are always used for good or positive indication, flashing Green/Amber if non-critical conditions exist. Amber LEDs indicate there is a critical fault present within the module.

4.3.1 PSU/Cooling Module

The PSU/Cooling LEDs are shown in Figure 4–1.

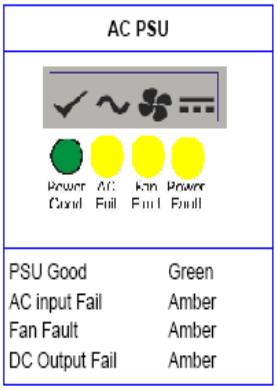


Figure 4–1 AC PSU LEDs

- Under Normal conditions the LEDs should all be illuminated constant GREEN
- If a problem is detected the color of the relevant LED will change to AMBER.

Table 4–1 AC PSU/Cooling Module LED States

Status	PSU OK (Green)	AC Fail (Amber)	Fan Fail (Amber)	Power Fail (Amber)
No AC Power (either PSU)	OFF	OFF	OFF	OFF
No AC Power (this PSU only)	OFF	ON	OFF	ON
PSU On OK	ON	OFF	OFF	OFF
PSU Fault (Over temp, over volts, over current)	OFF	OFF	OFF	ON
Fan Fault	OFF	OFF	ON	X

4.3.2 Ops Panel

The Ops Panel displays the aggregated status of all the modules. The Ops Panel LEDs are shown in Figure 4–2 and defined in Table 4–2.

Note The Ops Panel is supplied as an integral part of the Enclosure core product and is not user replaceable.

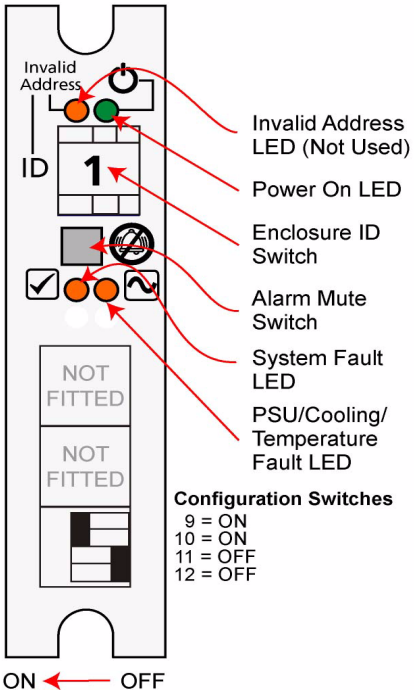


Figure 4–2 Ops Panel

Table 4–2 Ops Panel LEDs

Ops Panel LEDs				
Power (Green	**PSU/Cooling/ Temp (Amber)**	**System (Amber)**	**Other Associated LEDs or Alarms**	**State Description**
On	**Off**	**Off**		Power On, enclosure ready
On	**On**	**On**	Single beep, then double beep	Ops panel power on (5s) test state
On	**On**	**Off**	PSU LEDs or Fan LEDs intermittent audible alarm	Any PSU fault or Fan fault
On	**On**	**Flash**	intermittent audible alarm	Over or under temperature
On	**Off**	**On**	LED on EM	Processor on EBOD Module A failed
On	**Off**	**On**	LED on EM	Processor on EBOD Module B failed
On	**Off**	**On**	None	Unknown (invalid or mixed) module type installed, or 12C bus failed
On	**Flash**	**Flash**	PSU removed	PSU removed and system power redundancy check option set. no indication if option not set.
On	**Flash**	**On**	intermittent audible alarm	Ops to EBOD Module communications failed

4.3.3 EBOD Module

The EBOD Module incorporates the following LED indicators:

Table 4–3 EBOD Module LEDs

LED Functions	State	Description
Phystate Green	ON Flashing OFF	Ready Active Not Ready
System Health	Red Green Flashing Red	Fault Good POST

Note For details on how to remove and replace a module, refer to Section 4.8.

4.4 Troubleshooting

The following sections describe common problems, with possible solutions, which can occur with your IBM System Storage DCS9900 3S2 Storage Expansion Unit.

4.4.1 System Faults

Symptom	Cause	Action
1 The FAULT LED will illuminate AMBER on the EBOD Module. **2** Audible Alarm sounding.	The processor has detected an internal fault (for example failure of an internal communications path).	**1** Check for other AMBER LED indications on the Power Supply/Cooling modules. If there is a PSU error present there may be a communications problem with that Power Supply/Cooling module. Remove and then re-fit the module, if the problem persists then change the module. **2** Check for other AMBER LED indications on the drive carriers. If none are evident then there may either be a processor problem or a Backplane problem. **3** Ops Panel module faulty, please contact your supplier (Section 4.6.1).

Note Refer to Section 4.4.5.

4.4.2 Power Supply/Cooling Faults

Symptom	Cause	Action
1 Ops Panel FAULT LED AMBER. **2** An AMBER LED on one or more Power Supply/Cooling Modules. **3** Audible Alarm sounding.	**1** Any power fault. **2** A fan failure. **3** A thermal condition which could cause PSU overheating.	**1** Check Power On/Off Switch on rear of Power Supply/Cooling module is switched ON. **2** Check AC connection to Power Supply/Cooling module is live. **3** Disconnect the Power Supply/Cooling module from AC power and remove the module from the system. Re-install: if problem persists, replace Power Supply/Cooling Module. **4** Reduce the ambient temperature.

4.4.3 Thermal Control

The IBM System Storage DCS9900 3S2 Storage Expansion Unit uses extensive thermal monitoring and takes a number of actions to ensure component temperatures are kept low and also to minimize acoustic noise. Air flow is from front to rear of the enclosure.

Symptom	Cause	Action
If the ambient air is cool (below 25 °C) and the fans are observed to increase in speed, then some restriction on airflow may be causing additional internal temperature rise. **Note:** This is not a fault condition.	The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. This may be caused by higher ambient temperatures in the local environment and may be normal. **Note:** This threshold changes according to the number of drives and power supplies fitted.	**1** Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended. **2** Check for restrictions due to dust build-up; clean as appropriate. **3** Check for excessive re-circulation of heated air from rear to the front, use in a fully enclosed rack installation is not recommended. **4** Check that all blank modules are in place. **5** Reduce the ambient temperature.

4.4.4 Thermal Alarm

	Symptom	Cause		Action
1	Ops Panel FAULT LED AMBER.	If the internal temperature measured in the airflow through the enclosure exceeds a pre-set threshold, a thermal alarm will sound.	**1**	Check local ambient environment temperature is below the upper 40°C specification.
2	An AMBER LED on one or more Power Supply/Cooling Modules.		**2**	Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended.
3	Audible Alarm sounding.		**3**	Check for restrictions due to dust build-up, clean as appropriate.
4	Air temperature exiting PSU above 55°C.		**4**	Check for excessive re-circulation of heated air from rear to the front, use in a fully enclosed rack installation is not recommended.
			5	If possible shutdown the enclosure and investigate the problem before continuing.

4.4.5 Thermal Shutdown

The enclosure system will shut down when a critical temperature threshold is exceeded in order to prevent permanent damage to the disk drives.

Symptom	Cause	Action
1 ALL AMBER LEDs on the Ops Panel and on ALL drive bays illuminated flash. **2** Audible Alarm sounds almost continuously and cannot be muted.	At a higher threshold than the Thermal Alarm (this should already have been activated), the enclosure is programmed to shutdown in order to protect itself and the disk drives from damage. OR - All fans have failed. OR - Only 1 fan operating and the internal temperature is 40° C or above.	**1** Check for airflow restrictions. **2** Check Power Supply/Cooling module faults. **3** Check for excessive local temperatures.

Important **The Enclosure will SHUTDOWN 10 seconds after the above symptoms are observed. This will leave the following indications active.**

1 FAULT LED illuminated AMBER. **2** Enclosure powered off.	**1** Clear the source of the overheating. **2** Leave for a period to cool down. **3** Remove AC power from the enclosure for at least 30 seconds to reset the shutdown condition. **4** Re-start enclosure using normal operating procedure. **5** Check for re-occurring cooling faults (especially fan failure).

4.5 Drive Carrier Module Faults

Disk drive status is monitored by a Green LED and an Amber LED mounted on the front of each Drive Carrier Module, providing the following indications:

Table 4–4 Drive LED Functions

State	Green	Amber
No drive fitted	Off	Off
Drive Power ON	On	Off
Drive Activity[1]	On/Blink off	Off
Drive Fault	On	On
Drive Identification	On	FLASHING

[1] *Drive Activity - LED may be off for a length of time during power up.*

4.5.1 Dummy Carrier Modules

Dummy carrier modules must be fitted to all unused drive bays to maintain a balanced air flow.

4.6 Dealing with Hardware Faults

Ensure that you have obtained a replacement module of the same type *before* removing any faulty module.

Warning **If the IBM System Storage DCS9900 3S2 Storage Expansion Unit is powered up and you remove any module, replace it immediately. If the subsystem is used with modules or module blanks missing for more than a few minutes, the Enclosure can overheat, causing power failure and data loss. Such use will invalidate the warranty.**

- Replace a faulty drive with a drive of the same type and of equal or greater capacity.
- All drive bays must be fitted with a drive carrier module or a dummy carrier module in order to maintain a balanced air flow.
- All the supplied plug-in power supply units, electronics modules, and blank modules must be in place for the air to flow correctly around the cabinet.

4.6.1 Ops Panel

Important **The Ops Panel is an integral part of the enclosure chassis assembly and is not field replaceable.**

4.7 Continuous Operation During Replacement

If a disk unit fails, it can normally be replaced without interrupting the use of the system.

In addition, each enclosure contains two Power Supply/Cooling modules, either of which can maintain power and cooling to the subsystem while the other is replaced.

4.8 Replacing a Module

Warning **When replacing a module, NEVER leave an EMPTY bay in the rear of the enclosure. Obtain a replacement before removing the problem part.**

Please refer to Chapter 2 , ”Getting Started” for information on the initial installation of the plug-in modules in the IBM System Storage DCS9900 3S2 Storage Expansion Unit.

Warning **Observe all conventional ESD precautions when handling IBM System Storage DCS9900 3S2 Storage Expansion Unit modules and components. Avoid contact with backplane components and module connectors, etc.**

4.8.1 PSU/Cooling Modules

Warning **Do not remove covers from the PSU/Cooling module. Danger of electric shock inside. Return the PSU to your supplier for repair.**

4.8.1.1 Removing an AC PSU/Cooling Module

Warning **Do not remove the faulty PSU/Cooling module unless you have a replacement unit of the correct type ready for insertion.**

If a power supply unit or its fan is faulty, you must replace the whole PSU/Cooling module.

As there should always be two power supply units installed, you can continue working while replacing the faulty module.

1. Make sure you identify the faulty PSU/Cooling module correctly from the two modules installed.
2. Switch off and disconnect the power supply cord.
3. Squeeze the two latches on the PSU handle together (Figure 4–3) and open the handle to cam the PSU out of the enclosure (Figure 4–4).
4. Grip the handle and withdraw the PSU (Figure 4–3).

4.8.1.2 Installing an AC PSU/Cooling Module

1. Check for damage, especially to the rear connector on the PSU.

Caution *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2 With the PSU handle (Figure 4–4) in the open position, slide the module into the enclosure.

Important **install both Power Supply/Cooling modules in an "upside down" orientation.**

3 Cam the module home by manually closing the PSU handle (Figure 4–3). A click should be heard as the handle latches engage (Figure 4–3).

4 Connect the power supply cord to the power source and switch the power supply ON.

Note The alarm will sound until the new Power Supply/Cooling module is operating correctly.

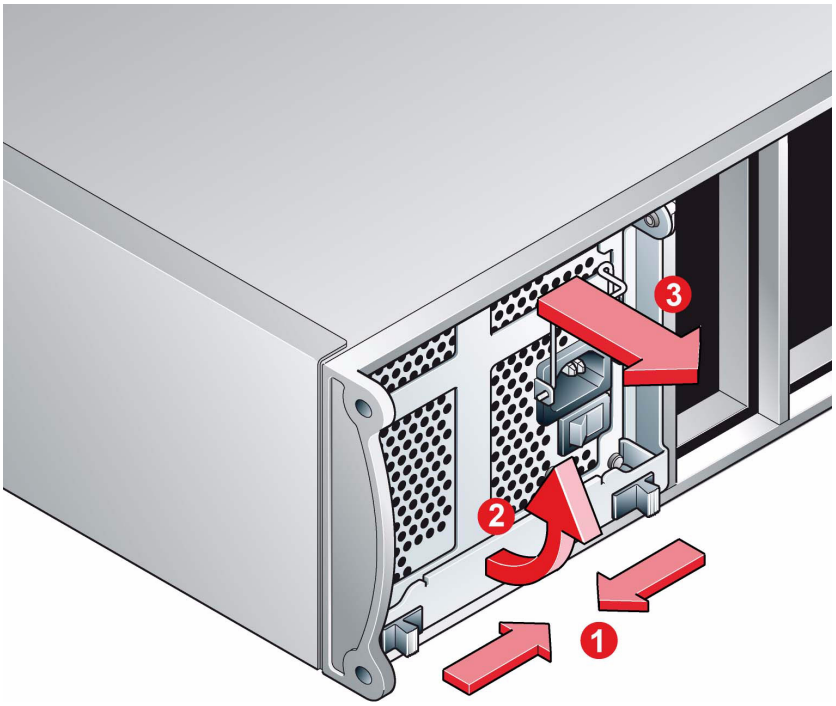


Figure 4–3 Removing/Inserting a PSU/Cooling Module

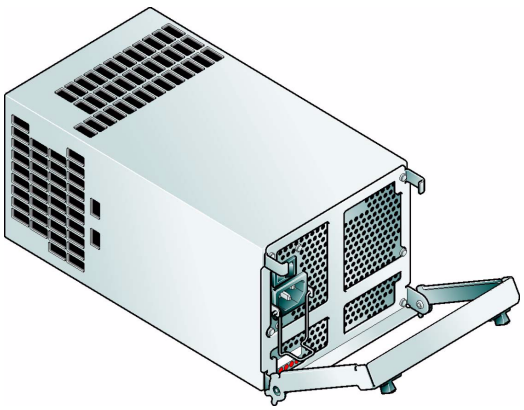


Figure 4–4 AC PSU/Cooling Module Handle in Open Position *(reverse orientation at installation)*

4.8.2 EBOD Module

Please refer to section 2.6, ”EBOD Module Installation”, on page 21 for full information on installing the EBOD module.

4.8.2.1 Removing the EBOD Module

Warning **Do not remove this module unless a replacement can be immediately added. The system must not be run without all units in place.**

1. Using two hands, grasp each latch between the thumb and forefinger of each hand. Squeeze thumb and forefinger together to release the latch. Pull the latches forward to cam the module out of the enclosure (Figure 4–7).

2. Grip the latch handles and withdraw the module (Figure 4–5).

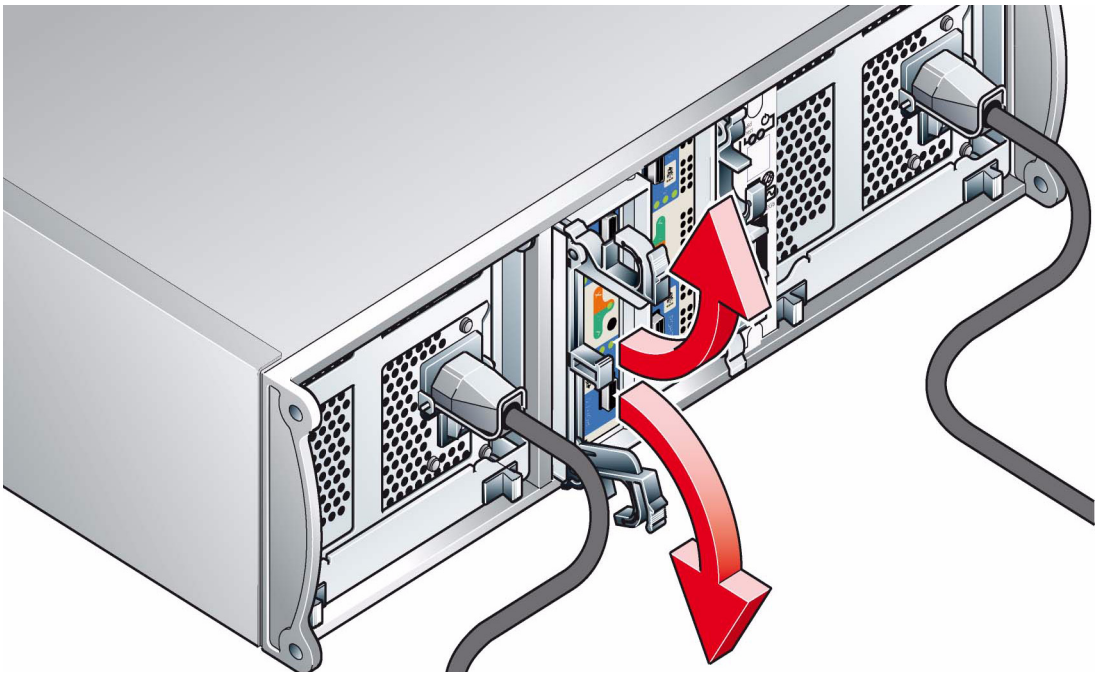


Figure 4–5 Removing an EBOD Module (1)

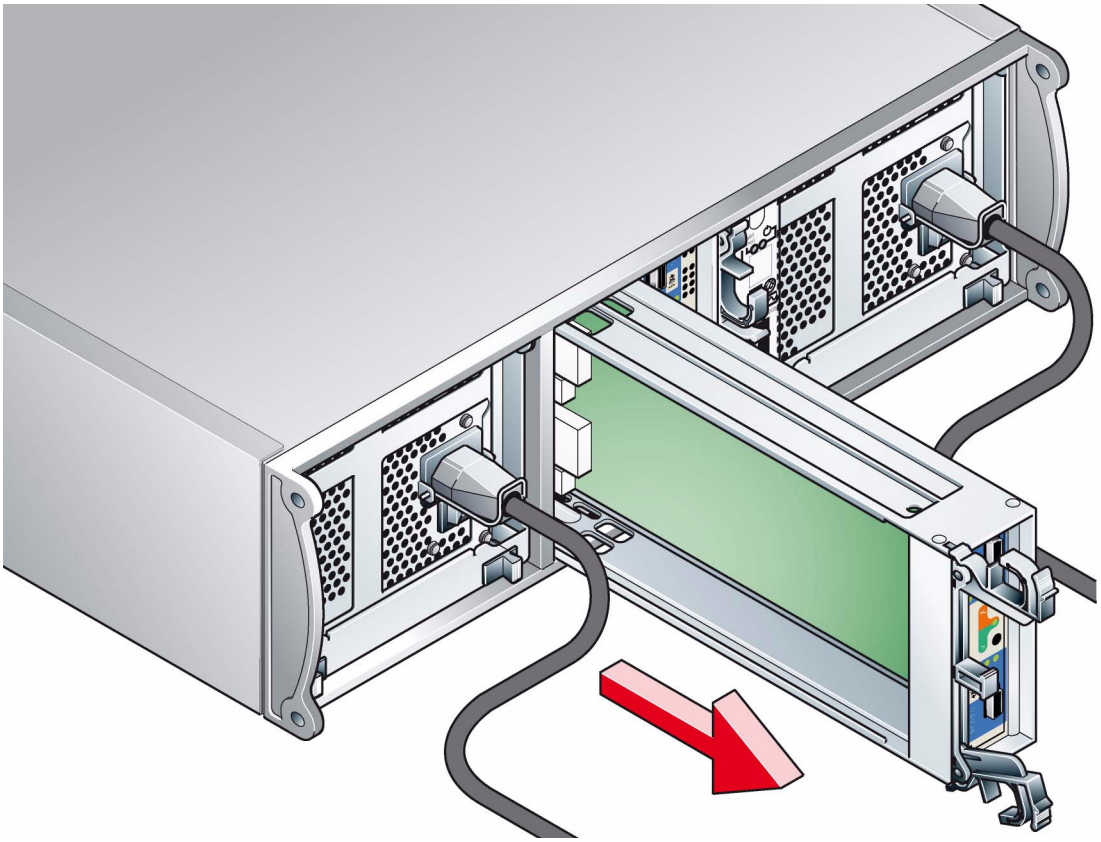


Figure 4–6 Removing an EBOD Module (2)

4.8.2.2 Installing the EBOD Module

1. With the latch in the open position, slide the EBOD module into the enclosure until the latch engages automatically.
2. Cam the module home by manually closing the latches (Figure 4–7).
3. A click should be heard as the latch engages.

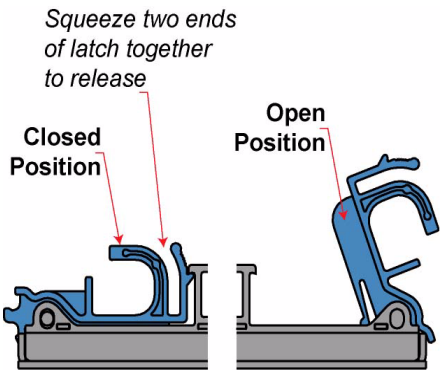


Figure 4–7 EBOD Module Latch Operation

4.8.3 Drive Carrier Module

Refer to section 2.7, ”Drive Carrier Configuration”, on page 22 for information on the initial installation of the plug-in modules in IBM System Storage DCS9900 3S2 Storage Expansion Unit.

Warning **Observe all conventional ESD precautions when handling IBM System Storage DCS9900 3S2 Storage Expansion Unit modules and components. Avoid contact with backplane components and module connectors, etc.**

4.8.3.1 Removal and Replacement

Caution ***Drive spin down***
*Damage can occur to a drive if it is removed while still spinning, we recommend that you perform **All** steps of the following procedure to ensure that the drive has stopped prior to removal:*

1 Release the carrier handle by pressing the latch in the handle towards the right.

Note The anti-tamper lock must be OFF.

2 Gently withdraw the drive carrier module approximately 1 inch (25mm), and wait 30 seconds.

3 Withdraw the module from the drive bay and fit a replacement module in accordance with the instructions in Section 2.7, ”Drive Carrier Configuration”.

4.9 Spare Parts and Ancillary Items

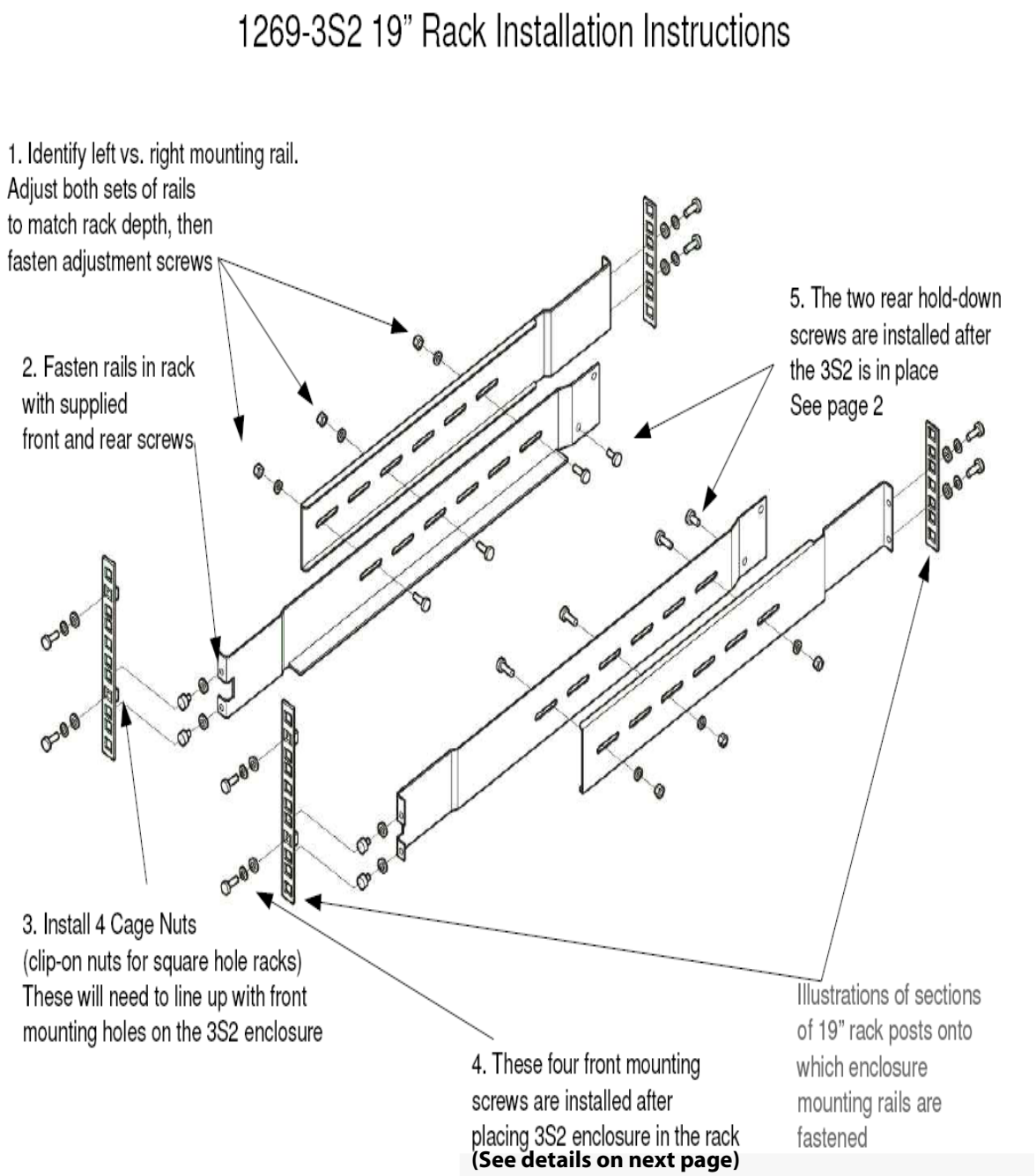
Table 4–5 displays the replaceable parts that are available for IBM System Storage DCS9900 3S2 Storage Expansion Unit:

Table 4–5 IBM MTM 1269-3S2 SAS Disk Chassis FRUs

Part Number	Description
46M5815	269-3S2 SAS disk chassis assembly FRU without drives
46M5816	power supply/fan AC 450W FRU
46M5817	SCM I/O Module FRU (EBOD Module)
46M5818	Op panel FRU
95P5317	drive module key FRU
46M7008	power cord FRU
95P5319	cable RS232 config FRU
46M5885	rail kit FRU
46M5820	146GB SAS HDD FRU for FC 3331 (4X4)
46M5821	300GB SAS HDD FRU for FC 3332 (4X4)
46M5822	450GB SAS HDD FRU for FC 3333 (4X4)
95P5325	Drive Filler FRU

A

1269-3S2 19” Rack Installation Instructions

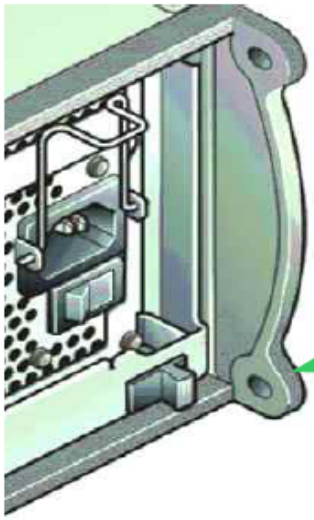

1269-3S2 19” Rack Installation Instructions
1. Identify left vs. right mounting rail. Adjust both sets of rails to match rack depth, then fasten adjustment screws
2. Fasten rails in rack with supplied front and rear screws
5. The two rear hold-down screws are installed after the 3S2 is in place
See page 2
3. Install 4 Cage Nuts (clip-on nuts for square hole racks) These will need to line up with front mounting holes on the 3S2 enclosure
4. These four front mounting screws are installed after placing 3S2 enclosure in the rack
(See details on next page)
Illustrations of sections of 19” rack posts onto which enclosure mounting rails are fastened

Step 4 Details:

a) Slide 3S2 onto mounting rails in the rack.

b)Fasten 4 screws into the 3S2's front mounting holes. These are secured into the cage nuts installed in Step 3

c) Four Plastic covers are included to cover the opening, install the the covers after fastening the screws



Step 5 Detail:
Fasten the rear hold-down screw to secure rear of enclosure.

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Additional Weblinks:

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http://www.ibm.com/ibm/environment/climate/climatebroch_nov2007.pdf

IBM Project Big Green:

http://www-03.ibm.com/systems/optimizeit/cost_efficiency/energy_efficiency/

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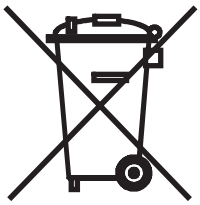

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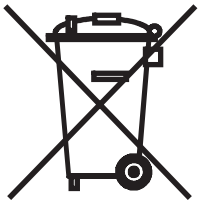

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DCS9900 1269-3S2 Storage Expansion Unit Installation, Service, and User Guide

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